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Lessons from the United States.

IN his presidential address to the I.M.E.A. on Tuesday last, Mr. R. B. Mitchell, finding little on this side of the Atlantic likely to form a cheerful subject, turned his mental vision westward, and told his audience what he had observed during his recent tour in the United States as a delegate to the I.E.C. Conference. An abstract of the address appears on a later page.

Naturally, Mr. Mitchell was impressed with the large sizes of the generating sets in vogue—conforming, of course, to the dimensions of the power stations; when a station is designed for an output of 400,000 kW, the most suitable size of set is in the neighbourhood of 50,000 kW, the number of sets installed being preferably between, say, 6 and 10. When, and where, a demand of this order exists, stations of corresponding magnitude must be erected; in the neighbourhood of Chicago an installation of 1,000,000 kW is contemplated, in which the generating sets will be rated at 100,000 kW each, but there is no justification on the score of economy, or of first cost, or otherwise for using any set of more than 50,000 kW capacity in this country. As Mr. Mitchell points out, the cost of stations per kilowatt installed is comparatively high in the United States, in spite of the use of large sets. We do not follow his suggestion that when interconnection becomes more general in this country larger sets will be required; it will always be cheaper to carry coal to the load centres than to transmit very large blocks of power over long distances, at the load factors which are conceivably attainable.

Mr. Mitchell was especially interested in the use of steam at very high pressure, which is being developed in America, the high-pressure turbines exhausting into the main steam ranges of plant working at ordinary pressures. As he points out, by this means the economic life of our existing plant may perhaps be extended at moderate cost; a saving of 7 per cent. of fuel is claimed for the system against which must be set the capital charges on the additional plant, probably of costly construction. The use of pulverised fuel he regards as inevitable when larger boilers are required. His reference to the completion of the plant at Lakeside, Milwaukee, is of special interest; this plant is of the type described in our issue of Sept. 11th, 1925, the invention of Mr. S. McEwen, A.R.S.M., in which pulverised coal is stripped of its volatiles by a stream of hot gas and is thus converted into pulverised coke, suit-

able for boiler firing. We pointed out in our issue of Aug. 21st, 1925, that this process offered the hope of utilising coal to the best advantage, including the recovery of the by-products.

Mr. Mitchell does well to dispel the impression that the price of electricity in the United States is materially less than in this country, and his references to the extent to which the ordinary consumer uses electricity in the household are interesting; but unfortunately he falls into the same error as the Weir Committee—that of comparing a most highly developed area (Chicago) with the whole of this country, in respect of energy consumed per head of population. If we reversed the process, we could claim that, as Sir Joseph Nall stated before Standing Committee C of the House of Commons on June 3rd, the urban district of Stretford has a consumption of nearly 800 kWh per head per annum—nearly double the rate of consumption in the whole of the United States; hence the latter is far behind this country in electrical development!

Very significant are Mr. Mitchell's comments on the extensive use of showrooms, the remarkable development of the hire-purchase system, and the attention given to the provision of service to the consumer. All these points, which he considers worthy of imitation, we have constantly pressed upon the notice of our readers as essential factors in the development of the domestic load. The enormous potentialities of that class of business have been recognised by American supply authorities, and are engaging the earnest attention of all progressive undertakings in this country. That is the most hopeful avenue not only to the prosperity of the electrical industries in general, but also to the cheapening of electricity all round, for it offers the best prospect for the improvement of load factor and the consequent reduction of distribution costs, which form by far the largest proportion of the total cost to the consumer, and are much more important than the cost of fuel.

A Domestic Campaign in the Autumn.

THE news that a great campaign for developing the domestic load is being planned for next autumn and winter will be welcomed by the entire electrical industry. The immense scope for progress in this branch of electricity supply in the United Kingdom and the benefits that are bound to follow for all sections of manufacturing and installation work are some of the most prominent amongst our present ideas. What we have to do is to find a most attractive way of making an effective appeal to millions of householders. The British Electrical Development Association, maintaining its reputation for looking well ahead and preparing appropriate measures, has decided to carry out an extensive publicity campaign jointly with the Lighting Service Bureau of the Electric Lamp Manufacturers' Association. From October next until the following April this campaign will proceed under the title "Wiring the Homes of Britain." Its popular appeal will take the form of a competition feature offering prizes to non-electrical readers who will study advertisements published in newspapers and journals having an aggregate circulation of 14,000,000 copies, read a book that is being produced by B.E.D.A., and engage in a ballot, particulars of which will be published later in the year. When it is mentioned that the first prize will take the substantial form of a valuable electric house, that the second will be some hundreds of pounds' worth of electrical equipment, and that there will be many other prizes of less value, it will be gathered that the competition will be on such a scale as to be worthy of the organisations that are behind it. There will be conjoint local efforts by B.E.D.A. and E.L.M.A., local exhibition electric houses, meetings and so forth, all of which it is hoped, will excite widespread inquiring interest on the part of the public.

We need do no more at the moment than announce that the organisation of the work is proceeding, and that a very large amount of money is to be expended upon it from the lately-increased funds of B.E.D.A., supplemented by a handsome additional contribution by the Electric Lamp Manufacturers' Association.

A Matter of Price.

ELSEWHERE in this issue a contributor discusses whether "cheapness" in connection with electrical products and electrical service, in comparison with gas products and gas service, is not receiving too much attention. The superiority of electrical service in the home is one of the publicity man's biggest talking points, of course, but it must not be forgotten, when we appeal to the millions, that the amount of money in the householder's pocket has much to do in many cases with settling his final course of action. While there may be something to be said for our contributor's criticism, it would be idle to question the need for securing low selling prices without sacrificing efficiency of product, giving, at the same time, ample facility for securing prompt assistance with renewals at reasonable prices, and other service accommodation such as gas companies make a practice of giving. It is almost impossible to exaggerate the importance of service—using the word in its wider sense—whether it be that of an electricity department or that of a supplier of apparatus. We must give greater attention to the need for removing vexatious obstructions from the path of the consumer. The electrical way should be made the easy way.

The Railways and the Bill.

ON Thursday last week Standing Committee C of the House of Commons accepted an amendment to the Electricity (Supply) Bill, exempting railway power stations operated by railway companies from inclusion in the scheme as "selected stations."

It is true that in most cases such stations are of 25-cycle frequency and are not suitable for immediate connection to stations of other frequencies, but that is a condition which, as we have pointed out, may prove to be only a temporary obstacle; moreover, the use of frequency-changers, though costly, and hardly justifiable in the case of stations of similar load factor, would be perfectly proper in this instance, for the combination of a heavy and continuous traction load with a public supply load is highly desirable.

We have expressed our regret that the Government has made no provision in this Bill to encourage and facilitate the electrification of our railways generally; and our regret is intensified by the apparent intention of the Government even to go out of its way to exclude the railways from the scheme, without obvious necessity. Sir Douglas Hogg, it is true, uttered a pious hope that the railways would some day be good enough to patronise the Central Electricity Board's establishments—but that sort of thing "cuts no ice."

What we wish to emphasise is that the omission of the railway load from the working of the scheme may be fatal to its economic operation, whereas the combination of the two classes of demand would render success practically a certainty.

Electrical Contractors at Brighton.

AT the moment of going to press there is every reason to hope that in spite of the difficulties of the times, the first annual Convention of the Electrical Contractors' Association at Brighton will be well attended. The programme of papers and events, which was published in our issue of April 23rd, p. 679, will be adhered to. Delegates will assemble at the Royal Pavilion, Brighton, on Wednesday evening for the reception by the president, Mr. T. E. Alger, followed by a dance. On Thursday the delivery of the presidential address and two papers on "Co-operation and Apprenticeship" will form the more serious part of the proceedings, while on Friday the subjects to receive attention will be wiring rules and registration. With the large attendance of contractors that is expected, and with a table fully loaded with such substantial food for thought and discussion, the E.C.A. should be in for a profitable and enjoyable time.

Glasgow Corporation Electricity Supply.

Dalmarnock Generating Station Developments.

THE Glasgow Corporation Electricity Department was inaugurated in 1890, the city in that year agreeing to acquire an undertaking with 300 kW of plant installed and about 30 consumers. By 1893 the Department had bought ground at Waterloo Street and built a new generating station there, which supplied direct current at 100/200 volts.

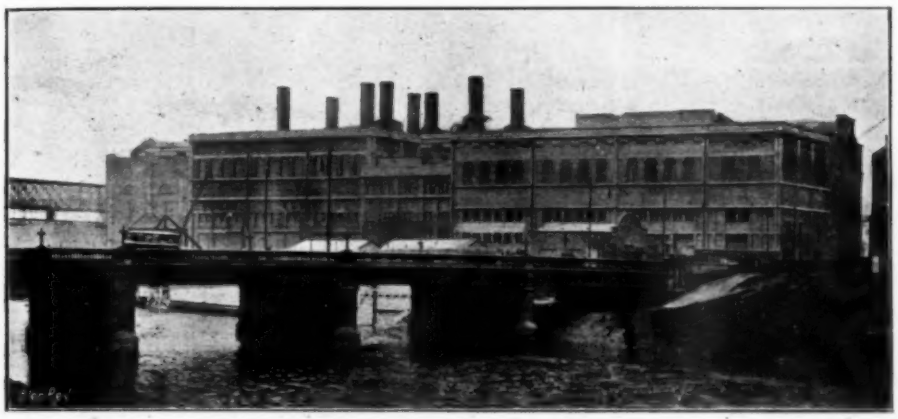


Fig. 1.—The Completed Building from Left Bank of Clyde.

It was soon realised that the demand for electricity would rapidly increase, and suitable sites for power stations were obtained at Port Dundas and Pollokshaws Road. Important installations, which served the city well, were erected at these points during the period when Mr. W. A. Chamen was the city electrical engineer. About that time the Board of Trade altered the regulations for public supply, and the city boldly adopted the pressure of 250/500 volts d.c.—the highest limit allowed. Mr. Chamen resigned in 1905, and was succeeded by Mr. W. W. Lackie, under whose energetic leadership the undertaking continued to make rapid progress until he accepted appointment as one of the Electricity Commissioners.

Mr. R. B. Mitchell, M.I.E.E., is the fourth ruler in the Glasgow electrical succession, and his reign, which commenced in 1920, is worthily marked by the growth of Dalmarnock, the fourth and by far the largest of the stations designed for the Electricity Department; it now carries the bulk of the city's

Fig. 2.—Aerial View of Dalmarnock Station.

Fig. 3.—One of the Boiler Rooms.

demand for industrial power and lighting, and last winter the peak load of the station was 85,000 kW.

Glasgow, by process of continued expansion, acquired ready-made central stations at Kelvinside, Govan, and Partick; these have now been relegated to the position of sub-stations. At the end of the last financial year there were 32 important sub-stations in active operation and another three nearing completion; in addition, there were 101 completed sub-stations on consumers' premises. The sub-stations are

of the static type for d.c., and have rotary converters for d.c. distribution.

The total quantity of energy generated for the year at the time of the last (1925) annual report was 220,040,292 kWh, and of this amount 174,917,610 kWh was sold to private consumers. The remainder was expended on lighting 4,030 public lamps and in distribu-

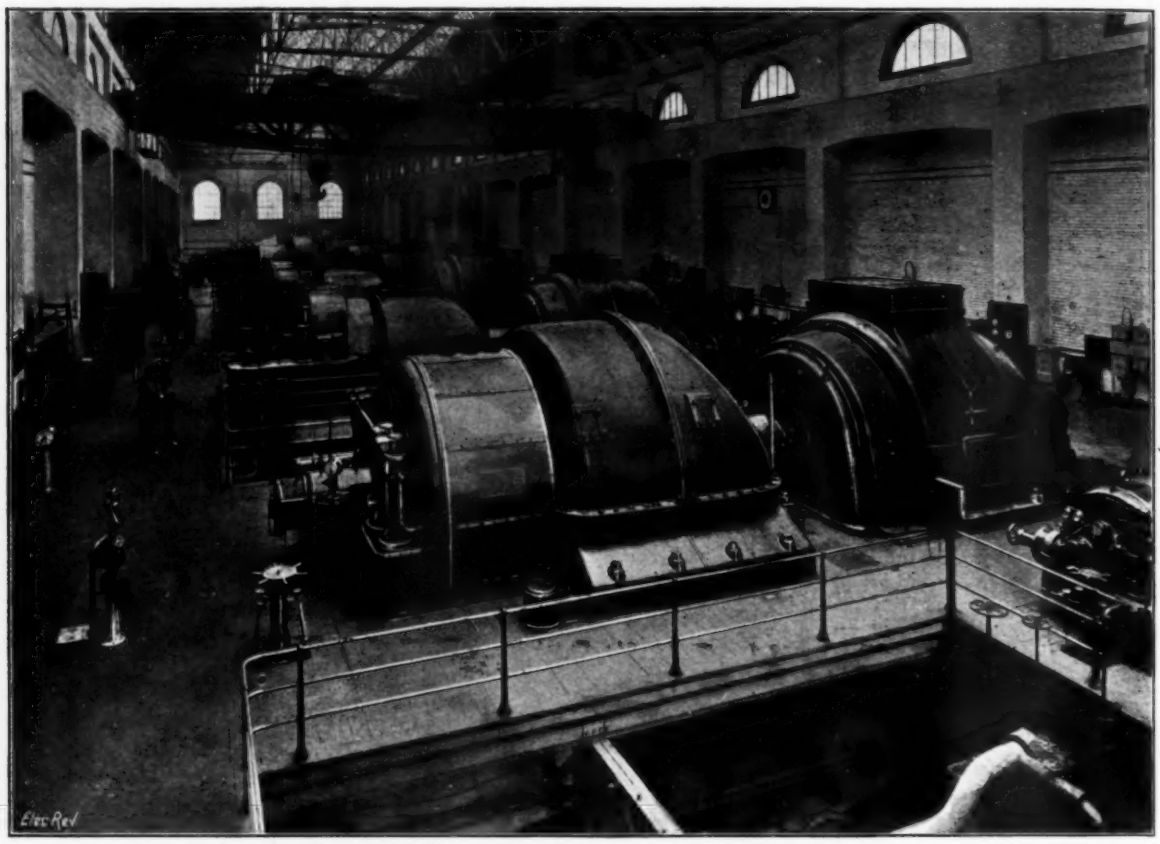


Fig. 4.—The Turbine Room, Dalmarnock Power Station, Glasgow.

tion. The gross revenue for the year amounted to £1,242,119.

The Glasgow Corporation was a pioneer in the encouragement of the all-electric house movement, and has successfully operated an assisted-wiring scheme for small houses. The wiring is done by contractors at agreed rates, and payment by the consumer is spread over a number of years. Over 2,000 separate premises have been fitted under this scheme to March this year. The displacement of gas by electric cookers is making rapid progress, and there is a special rate of ¾d. per unit for domestic cooking and heating, which is attained after 730 hours' use per annum of the maximum demand for lighting. The ordinary domestic lighting rate is at present 4½d. per kWh. An alternative "two-part" rate is available to domestic consumers. The parts are: (A) A fixed service charge per annum; and (B) a charge of ½d. per unit for all energy consumed.

The Electricity Department is extending its showrooms, and has a capable staff specially devoted to publicity and demonstration purposes. Recently an attractive lighting bureau, largely supported by the Corporation, was inaugurated in central Glasgow, and has proved most successful. At the new refuse destructor plant now being installed by the Corporation at Govan electro-magnetic separators will be used for fuel section, and the steam generated will be utilised in conjunction with frequency rectifiers.

Dalmarnock Generating Station.

The Dalmarnock station is on the north side of the River Clyde, with easy access to abundant water supplies; it was designed for an ultimate capacity of 200,000 kW. The switch-house buildings and annexe screen the greater part of the works when viewed from the south bank of the river, as is evident from fig. 1. In the centre of the switch-house buildings is the administrative block, with a battery room in the basement; the 250-volt battery contained therein is used chiefly for excitation. On the top floor the control room is placed, and from this ordered and quiet apartment the giant

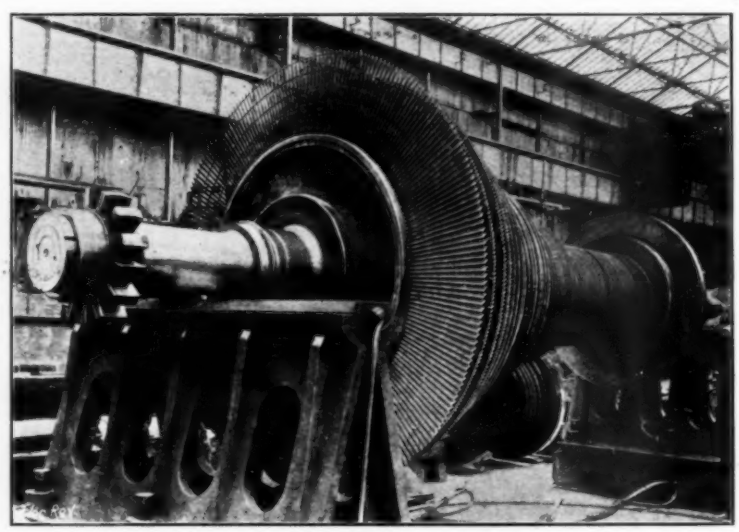


Fig. 5.—A Completely Bladed "Parsons" Turbine Rotor.

switches are operated and the whole electrical control of the station is carried out. A gangway opening from the control room leads to a balcony overlooking the turbine room.

Switch Houses.

The generator and outgoing feeder switchgear is of the metal-boxed, oil-immersed type, and is designed to attain a high degree of safety. The bus-bars are compound-surrounded and completely and continuously metal-clad. The step-up transformers, which raise the generated voltage of 6,500 V to 20,000 V, are housed below the 20,000-volt switchgear.

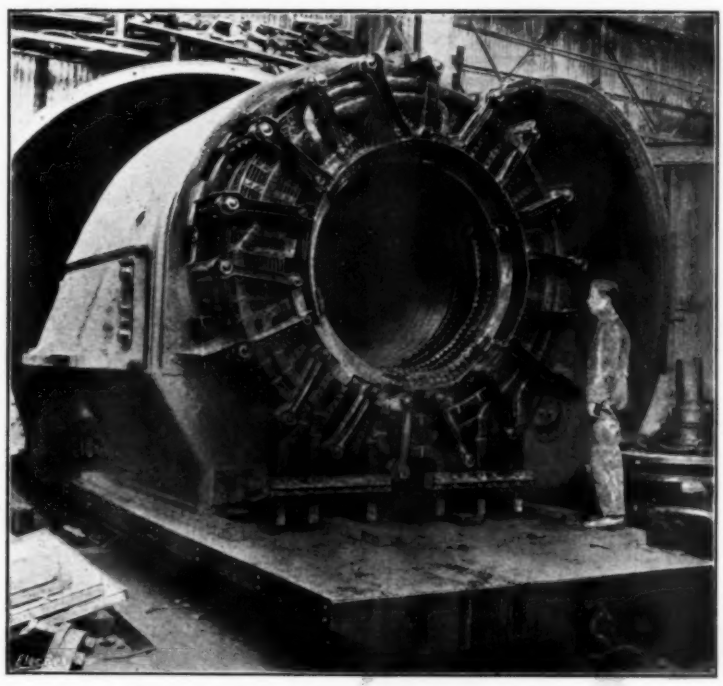


Fig. 6.—A "Parsons" Stator entering the Vacuum Oven.

Each of the large 6,500-volt alternators has its own bank of three single-phase transformers. The individual transformers are rated at 7,800 kVA, single-phase, 25 cycles, and the bank of three forms a 3-phase unit of 23,400 kVA. The h.p. and l.p. windings are sleeved with cambric, and the coils are insulated and spaced by shaped sheets of Fullerboard.

Each transformer is contained in a stout boiler-plate tank adapted for forced oil cooling. Water is circulated to the oil coolers, and relief valves are provided and adjusted so that the oil pressure is in excess of the water pressure. Should leakage occur, the balance ensures that the water cannot leak into the oil.

The transformers have a full-load efficiency of 98.89 per cent. and a half-load efficiency of 99.06 per cent.

Between the switch-house building, which contains these transformers, and the turbine house is a culvert 11 ft. wide, running the entire length of the building. This is being constantly filled from the Clyde, the water being first cleansed from *débris* by barred gratings, endless perforated metal bands, and ingenious rotating disk screens. The water from this culvert is pumped through the turbine condensers and passes to a similar discharge culvert on the other side of the turbine house. Each turbine set requires about one-and-a-quarter million gallons of water per hour.

The Boiler Houses.

The boiler houses, which have their axes at right angles to the turbine house, are clearly shown in fig. 2, which is an aeroplane view of the station. Each room contains eight boilers of the Babcock marine type, and they are arranged four on each side of a room, as shown in fig. 3, which also illustrates the chain-grate stokers. The feed water is heated to a temperature of 150 deg. F. by turbine steam before entering the boilers. The boilers are fitted with integral superheaters designed to increase the steam temperature to a total of 700 deg. F. Green economisers are employed, housed on the floor above the boilers, where also are the induced-draught "Sirocco" fans. Each boiler has a normal evaporation of 50,000 lb. per hour with a hot-well temperature of 150 deg. F., the calorific value of the fuel being taken at 10,500 B.th.u. per lb. The station standard steam conditions are 270 lb. per sq. in. gauge pressure at the turbine stop valves, 700 deg. F. total temperature, and there is an exhaust vacuum at full load of 29.1 inches (barometer at 30 inches).

Two of the boilers now being installed are fitted with Murray tubes, and their performance will be noted with interest in these days of striving for greater thermodynamic efficiency. Each pair of boilers is served by one steel chimney. Until now the ash has been dealt with by suction methods, but the latest boilers are provided with sluicing channels and pits.

The coal storage and handling arrangements are specially extensive and complete, and both electric and fireless steam locomotives are employed for shunting in this department.

The Turbine House.

Coming back to the turbine house, we note that generally the steam from a nest of four boilers passes through two 12-in. diameter pipes to a receiver in the basement, and this receiver is connected to a turbine by a 16-in. pipe. The receivers are themselves interconnected through two 12-in. pipes. The turbo-alternators are each continuously rated at 15,000 kW and generate at 6,500 volts. The condensers and their gear are placed in the basement, as indicated in the foreground of fig. 4, which is a general view of the turbine room.

No. 1 set, in the foreground, is by Messrs. Fraser and Chalmers, with a Metropolitan-Vickers alternator, and has a Mirrlees ejector condenser.

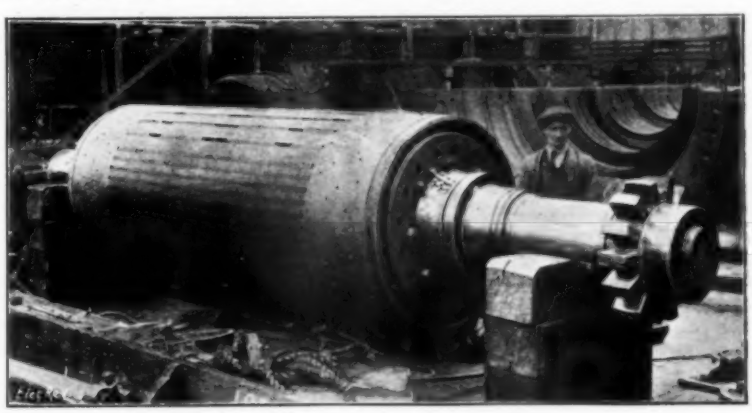


Fig. 7.—The Completely Wound Rotor.

Nos. 2 and 3 are Metropolitan-Vickers turbo-alternator sets with an M.-V. rotary air pump condenser on No. 2 and a Westinghouse-Le Blanc condenser on No. 3.

Nos. 4 and 5 are complete English Electric units, No. 4 having a Mirrlees condenser. This make of condenser has also been adopted for the most recent sets, installed by Messrs. C. A. Parsons & Co.

The Parsons Turbo-Alternators.

These two new sets, Nos. 6 and 7, have single-cylinder turbines of pure reaction design, while the five earlier turbines are all of the impulse type. Fig. 5 is a photograph of the turbine rotor with the mild-steel blades all fixed in position. For the first twelve expansions, axial clearance or "end-tightened blading" is adopted. (This efficient type of blading was described in the ELECTRICAL REVIEW of July 9th, 1920.)

Owing to the large diameters of the steam rotors at their last expansions, and the consequent difficulty of forging in one piece, the necessary diameters have been made up by the use of bolted annular disks so butted that vibration is impossible.

Following Messrs. C. A. Parsons's practice with similar machines, the centre of the shaft has been pierced along its axis to ensure that the forging is free from flaws.

The new alternators have, like the earlier units, direct-coupled exciters, and the voltage regulation is carried out entirely on the shunt field circuits of the exciters.

The stator is illustrated in fig. 6. The core conductors are of "Parsons" helically-stranded coreless cable manufactured in the required D shape.

The rotors are of barrel type, with the windings of copper strip having mica insulation. Fig 7 illustrates a completely wound rotor.

The alternators are provided with the Parsons closed-circuit ventilating system, using surface air coolers. This method is very efficient, and improves the external appearance of the sets, which have a clean and pleasing outline. These sets are designed for 18,750 kW (23,450 kVA), 6,600 volts, 2,050 amperes, at 0.8 p.f., 25 cycles, at the speed of 1,500 r.p.m. They are expected to give highly effective service.

Steel Works Modernisation.

The Electrical Equipment of the New Plate Mill, of the Consett Iron Co., Ltd.

ONE of the most important examples of steel works reconstruction completed in recent years is the plate mills of the Consett Iron Co., Ltd.

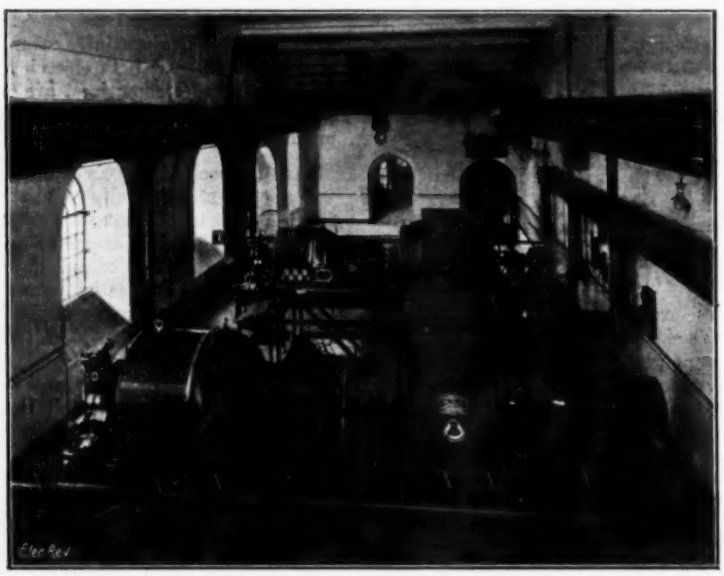


Fig. 1.—Part of the Steel Works Electricity Generating Station.

The site of the original mills having been entirely cleared, new buildings and plant have been installed throughout, the aggregate capacity of the main and auxiliary machinery supplied by the English Electric Co., Ltd., amounting to some 60,000 kW; since 1906 this Company has been responsible for the installation of over 300,000 h.p. of main rolling-mill drives.

The Consett Iron Co.'s new plant consists of: 40-in. two-high reversing slabbing mill with 8 ft. 6 in. rolls; 42-in. two-high reversing plate mill with 9 ft. 6 in. rolls; 32-in. three-high light-plate mill with 6 ft. 6 in. rolls; 30-in. chequer-plate mill with 6 ft. 6 in. rolls.

The slabbing mill is designed for dealing with ingots up to 10 tons in weight, and its product is passed in the form of slabs to both the large-plate and the light-plate [illegible] to approximately 9/16 in. thick, and the latter to 7/16 in. as averages; a proportion of the light-plate mill product passes on to the chequer mill. Electrical drives have been used throughout for the main and auxiliary machinery, the latter including live rolls, manipulators, screw-downs, shears, skids, cranes, &c. The Consett Iron Co. has equipped a generating station with two 3,000-kW, 3-phase, turbo-generators and a 1,000-kW, d.c., geared turbo-generator, in addition to three 1,500-kW rotary-converter sets for d.c. auxiliary power. As an additional source, a parallel supply is taken from the Newcastle-upon-Tyne Electric Supply Co., which can be either utilised as 3-phase power or converted by the above-mentioned rotary converters to direct current.

Each of the "English Electric" alternators (fig. 1) has an output of 3,000 kW, 3 phase, 40 cycles at 3,300 volts; the geared set consists of a 3,000-r.p.m. turbine driving a 1,000-kW, 550-V, d.c. generator at 600 r.p.m. The converter house (fig. 2) contains two 1,500-kW rotaries; the incoming voltage to the transformers is 3,000 V, and the d.c.

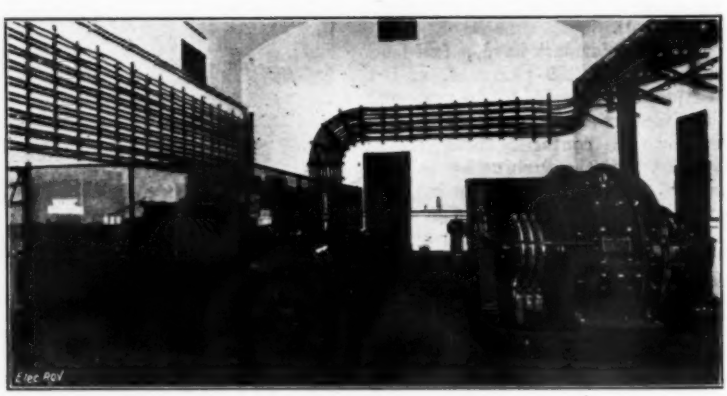


Fig. 2.—The Rotary Converter House.

[illegible] output is at 480/525 V, the machines being level compounded-wound within this voltage range. The third converter (of similar power) is housed in the same building

as the main flywheel-equaliser sets, and is shunt wound. This difference in windings was decided upon as the latter machine is much closer to the auxiliary machines which it supplies, and the falling characteristic of its shunt winding corresponds to the drop in voltage in the longer leads from the level compound-wound machines.

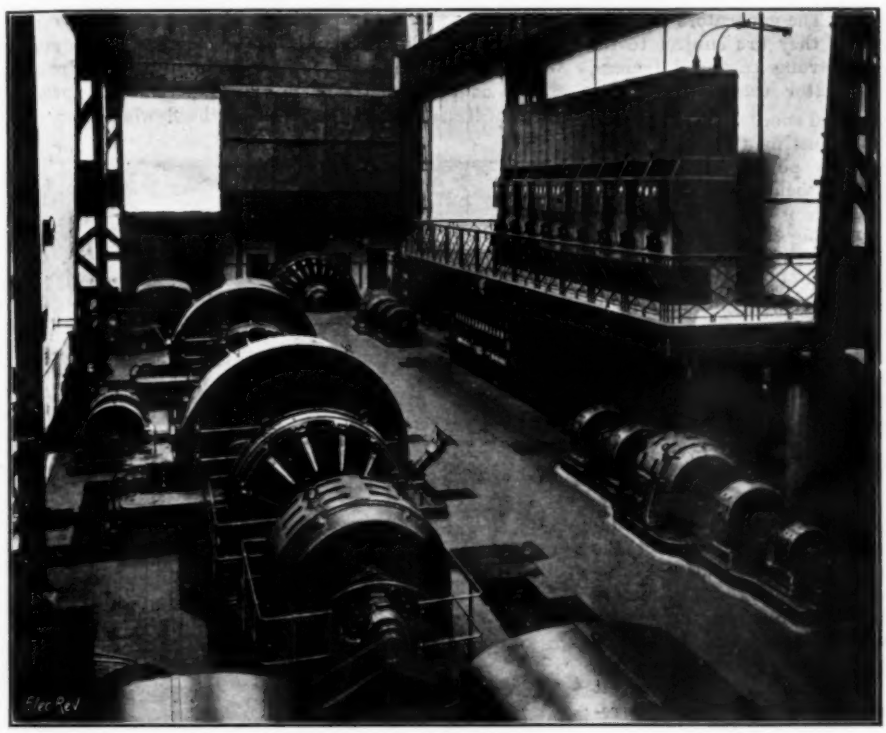


Fig 3.—Motor Room and Switchboards.

All three embody roller bearings and "tap" starting. The 40-in. slabbing mill and the 42-in. plate mill are both two-high and driven by reversing motors which take their power from two flywheel equaliser sets illustrated in fig. 3; the incoming 3,000-V switchgear is on the platform on the right, below which is a d.c. distribution board for pumps, fans, &c. On the left are the two flywheel sets mounted in line together by means of a flexible coupling. The two exciter sets appear partly under the switchboard gallery, whilst in the foreground is one of the automatic slip regulators which maintain the input to the motors of the flywheel sets approximately constant by varying the speed of the set. On the extreme left in the centre of the flywheel sets can be seen a small motor-generator barring set, the duty of which is described later.

The reversing motors are duplicate machines of the double-armature type (fig. 4) designed for a peak power of 14,000 h.p. at 50 r.p.m. and a speed range of 0/50 r.p.m. at constant torque and of from 50/100 r.p.m. at approximately constant horse-power. The massive construction of these machines is illustrated by their leading particulars:

Weight of each complete motor, 180 tons.
Weight of two armatures, 80 tons.
Diameter of shaft extension, 26 inches.
Overall length, 324 inches.
Overall width, 211 inches.

The two halves of each machine are exact duplicates, and the shaft is extended at the remote end so that should any accident happen to the shaft end at present being used for driving, the armatures can be interchanged. The bearings are ring lubricated, but in addition a motor-driven pump provides flood lubrication if desired; forced ventilation is employed, filtered air being blown by motor-driven fans through ducts in the foundations up into the centre portion of the machines, whence it is distributed through the amatures and frames and finally blown out over the commutators. No through shaft is employed; each armature is fitted with its own stub shaft, and the connection between the two is formed by a steel ring which registers on coned extensions of the spiders; keys take the drive between the two machines, so relieving the coupling bolts from any shear strain.

The d.c. for each reversing motor is provided from a flywheel equaliser set, consisting of a 3-phase induction motor of 3,000 h.p. driving two variable-voltage generators, between which is mounted a built-up cast-steel flywheel, 48 tons in weight and 11 ft. 3 in. in diameter. The flywheel sets are duplicates of one another and are arranged in line so that they can be coupled together for further equalisation of the load, the coupling between the two machines being of a "flexible" type, made by the Wellman Bibby Co., designed to transmit momentary peak loads up to approximately 14,000 h.p. Each set is approximately 40 ft. long, but the use of solid couplings and five bearings has not introduced bearing difficulties whatever. The flywheel bearing lubrication pumps work to about 150 lb. per sq. in., under which conditions the flywheels float on a film of oil, making it possible to start the set with less than half load on the motor; double lubrication is employed, pumps belted to the

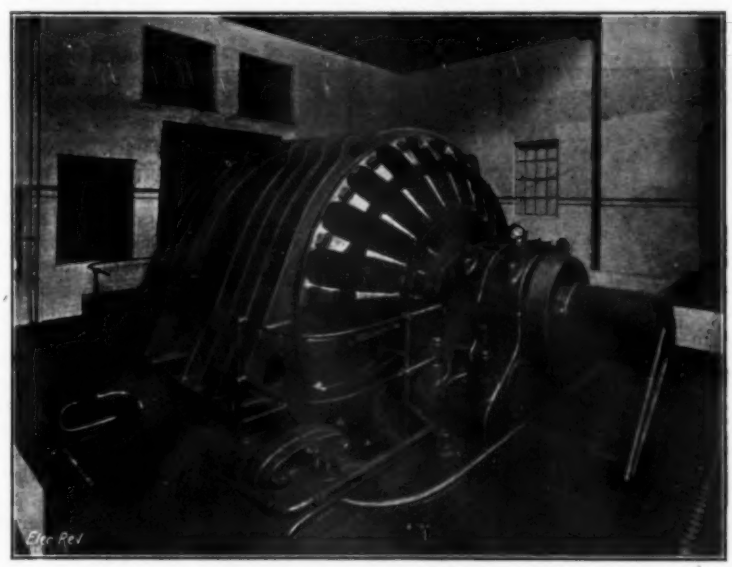


Fig 4.—Large-plate Mill Reversing Motor; 14,000 h.p.

flywheel shaft being in use when the set is running, while motor-driven pumps are used during the starting and shutting down periods and as a standby.

The motor driving each of the flywheel sets is of the 3-phase induction type, wound for an incoming pressure of 3,300 volts, 40 cycles, and drives the set at a synchronous speed of 600 r.p.m.; the working speed range is between 590 and 470 r.p.m. The generators in series supply the mill motors, and as they are subject to the peak demands have specially strong cast-steel frames, armature spiders, and commutator centres.

The control of the direction and speed of the reversing motors is brought about by adjusting the fields of the exciter machines which provide power for the fields respectively of the mill motors themselves and of the generators supplying them with power. The exciter sets consists of five machines (owing to the fact that the driving motor in the centre is synchronous, for which d.c. excitation is required) as follows:—Bucking exciter for mill-motor field; main exciter for mill-motor field, and for exciting the other exciter machines; synchronous driving motor for power-factor correction; exciter for fields of variable-voltage generators; and exciter for synchronous motor.

The employment of synchronous motors for driving the exciter sets was decided upon with a view to bringing approximately to unity the power factor of the complete plant, including the two flywheel sets, the light-plate mill motor, and chequer-mill motor. Each machine can provide 800 wattless kVA, a total for the two of 1,600 kVA. The use of quick excitation resistances for reducing the time constant of the mill motors and variable-voltage generators, thus ensuring very rapid acceleration, has been discarded in favour of special compound windings on the exciters which avoid loss of energy in resistances, with the result that the size of the motor driving the exciter set is reduced by about one-half, and in the present instance only approximately 110 h.p. is required for the purpose.

On the switchboard a panel is fitted with recording instruments to enable test readings to be taken of the operation of any equipment; throw-over switches allow the instruments to be inserted in either the slabbing mill motor or the plate mill equipments. The main controllers for the reversing motors, which regulate the exciter fields, are not on the control platforms in the

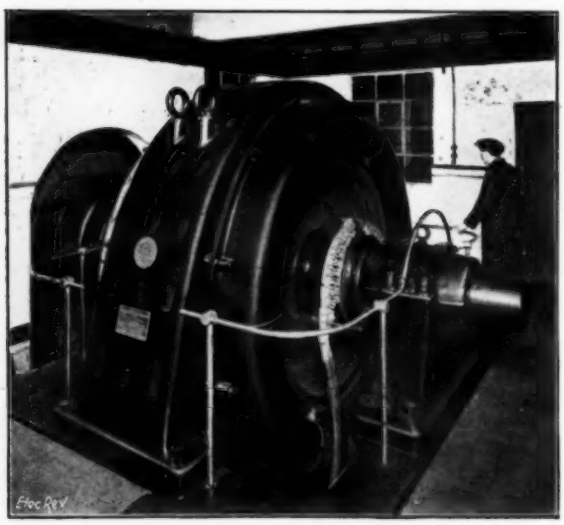


Fig. 5.—Light-plate Mill Induction Motor; 2,500 h.p.

mill where they would be subject to metallic dust and bad atmospheric conditions generally, but placed in the flywheel house reasonably adjacent to the exciter sets. The only connection between the control lever on the mill platform and the controller itself is a single play-pipe (filled with alcohol and water solution) ending in a diaphragm mounted in the pedestal of the control lever at the one end and in a similar diaphragm attached to a rocking valve lever at the controller end; movement of the control lever displaces the diaphragm from the central neutral position, synchronous movement taking place of the diaphragm at the controller, opening a valve which admits pressure oil to an operating servo-motor, which in turn sets the controller arm corresponding to the position of the control lever.

The mill driver stands adjacent to the instrument desk, so that the various instruments give him information as to the current flowing to, and the speed of, the mill motor and the speed of the flywheel set; a red

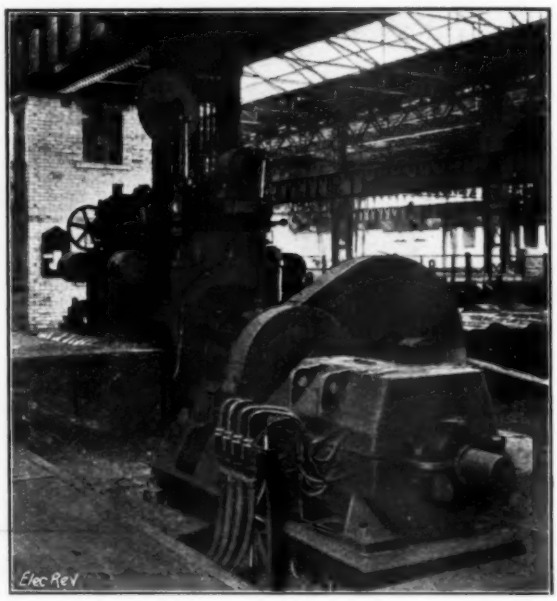


Fig. 6.—Plate Mangle Motor; 100 h.p.

lamp also warns him if the speed of the flywheel set has been reduced below the lower working limit, while "stop" and "start" push buttons enable him to close a relay circuit which opens or closes the field of the main exciter.

The various master controllers mounted in the background operate contactor gear which controls the screw-down motors, manipulator gears, and live rolls, while the automatic slip regulators have spring balancing devices for the moving blades in a soda solution in the tanks. The position of the blades in the tanks determines the resistance in the rotor circuit of the motor driving the flywheel set and consequently regulates its speed; the extent to which the blades are immersed is determined by a torque motor which drives the blade spindle through a chain, and the power of the torque motor is obtained from the input current to the flywheel motor. So long as the current to this motor remains at the desired value, any tendency to rotate on the part of the torque motor is counterbalanced by the weight of the blades. With increasing current the torque motor overcomes the counterbalancing force and raises the blades in the liquid, inserting resistance, which produces a fall in speed and thus liberates energy from the flywheel. With a reduced current the reverse action takes place, the weight of the blades causing them to enter further into the liquid, reducing the resistance, and thus speeding up the flywheel set again.

It was considered desirable to have means for obtaining slow movement of either of the main reversing motors or the flywheel sets. The provision of barring equipment on each machine would have been somewhat cumbersome, so the difficulty was overcome by the introduction of a heavy-current low-voltage motor-generator set; by this means current can be passed through the armature of either of the mill motors, or of any of the variable-voltage generators, of sufficient magnitude to produce half full-load torque with the fields of the machines normally excited, and a speed

which corresponds to a few revolutions per minute. The barring set is brought into use by plugging it on to the main bars which feed the particular machine to be rotated.

The heavy current, of the order of 12,000 amperes cut-out value, flowing between the generators of the flywheel sets and the mill motors necessitated the use of copper strip connections, and to accommodate them and the large number of field connections which pass between the various machines, the controllers, and the switch-board, an underground tunnel was constructed from one end of the motor house to the other; the two flywheel sets are placed approximately half-way between the two motors, and where the connections from the generators enter the tunnel the bars are arranged with a system of links whereby inter-changeability of any generator with any motor is possible. This will ensure continuity of production of either mill in the event of an accident to any one of the generators, the change-over of the main connections being accompanied by a corresponding change-over of the various field connections, and a switch-board, behind the d.c. switchboard, carries the necessary apparatus for this purpose.

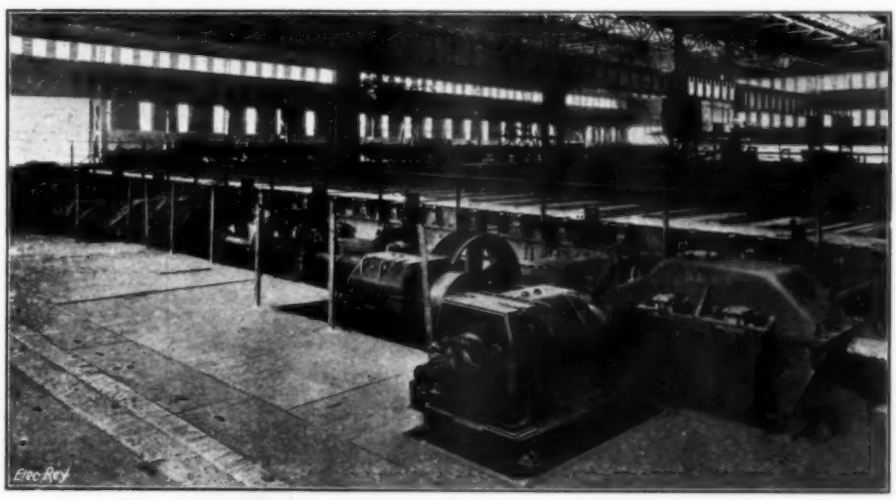


Fig. 7.—General View of the Cooling Bank, showing Live-roller and Skid-gear Motors.

The light-plate mill is of the three-high "Lauth" type, in which the top and bottom rolls are power driven and the intermediate roll is brought into contact alternatively with the top and bottom rolls, and is rotated by friction by the roll with which it is in contact. A continuous-running 3-phase induction motor (fig. 5) of 2,500 h.p., running at 240 r.p.m., provides the necessary power, and interposed between it and the mill is a flywheel 38 tons in weight and 16 ft. in diameter; reduction gear, combined with pinions, reduces the motor speed to the 60 r.p.m. of the mill. The control pillar is of the standard "truck" type, and a liquid starter is employed; in conjunction with the latter there is a permanent metallic slip resistance designed for a drop in speed of 10 per cent. from no-load to full-load, so that the stored energy of the fly-wheel may be utilised for the heavy "passes."

The chequer-plate mill consists of a single two-high stand running continuously in one direction, one "pass" sufficing to "chequer" the plate, driven by a 3-phase motor designed to take peaks up to approximately 1,500 h.p.; it is of the simple induction type, runs at 240 r.p.m., and is geared down to the mill speed of 35 r.p.m. Overhung on each side of the pinion of the reduction gear is a flywheel 8 ft. 6 in. diameter, weighing 11¼ tons, and the energy of these two wheels is brought into play by the introduction of a metallic slip resistance in the rotor of the induction motor.

Direct-current motors for such duties as live rolls, screw-down gear, manipulators, mangles, cranes, &c., have been adopted for use throughout the whole plant, as well as for similar duties in the angle and bar mills, which have also been reorganised. The "mill type," Class MM, is specially designed for the very heavy duty entailed, and four of them are used in connection with the slabbing mill. The two which operate the manipulators are each of 100 h.p. at 550 r.p.m.; one, of 60 h.p., controls the tilting device, and one of the two screw-down motors of 60 h.p. is mounted up on the top of the mill housing. The motors are of compact and strong design, and so built that in the event of an accident to the driving-shaft end, the whole machine can be reversed, thus bringing into action the shaft extension at the other end. The insulation used is fireproof, and precaution has been taken to prevent the lodgment of dust where it may cause trouble.

Fig. 6 shows a motor of this class, of 100 h.p., driving one of the plate mangling machines, but it differs from those previously referred to in that, in order to prevent excessive speed when no plate is in the mangles, a shunt winding is fitted as well as a series winding.

A view of the cooling banks appears in fig. 7, and in the foreground are seen the live roller and skid gear motors, the former of 40 h.p. and the latter of 60 h.p.

Some idea of the extent to which power is used for auxiliary machinery is indicated by the fact that over 280 motors have been supplied in conjunction with this equipment.

Independent Power Plant.—In a booklet by Mr. W. C. Mountain entitled "A Word in Favour of the Independent Power Plant," he defends the small power installation against the present movement in favour of the large supply station. He takes up the cudgels for the self-contained plant in the first place on the ground of the saving in distribution costs. The distribution costs of electric supply plants are out of all proportion to generating costs, and the bearing of this on the isolated plant is obvious. The author claims that an up-to-date independent plant with a good load factor can generate energy as cheaply as, or even more cheaply than, the big supply station, and he suggests that insufficient attention is given to the question of efficiency in the case of the small station. In dealing with the competition of the larger undertakings, he says that they will often go to very great lengths rather than allow the installation or continuance of independent power plants in their districts, and asserts that rates are frequently quoted which must be below cost price. Compensation is hoped for in the complicated and indefinite systems of charging, which are all in favour of the power company. The author points to the unfairness of the maximum demand system of charging, as the consumer may be debited for a quarter or a year with a maximum demand which may occur only once for a short period due to exceptional circumstances. In dealing with power factor, the author refers to the clauses inserted in the consumers' agreements whereby the energy charges are increased if the factor falls below a given figure, usually 0.8, which may mean a very heavy additional charge. Reference is also made to the attractive offers by supply authorities to induce consumers to dispose of their private plant and take a public supply. These offers are usually covered by a 3- to 5-years' agreement, at the end of which period, the author points out, the charges can be increased. Transformer losses in the consumer's equipment are not favourable to the consumer. Another disadvantage to the consumer is that he has no stand-by plant to meet a failure in the public supply. In dealing with the reliability of the public and independent plants the author makes reference to the proposal to supply the whole country from a few mammoth stations, and points out that in such a case the whole supply for the country could be more easily shut down in the case of war or industrial dispute. Among the many advantages claimed for the independent plant is that of the facilities afforded for the use of the heat in the exhaust steam.

Artificial Daylight.

With Special Reference to a New Installation.

By W. J. JONES, B.Sc., A.M.I.E.E.

It is well known that the light emitted from the ordinary gasfilled lamp has a greater proportion of red radiation than daylight, say, from a north or even a cloudy sky, and it is essentially in order to facilitate colour matching and the grading of materials that electric lamp manufacturers have devised special incandescent lamps, which, with their selectively tinted daylight bulbs, emit light that is very similar to daylight, since the blue bulb effectively filters out the excess of red light.

Fig. 1.—Lighting from Four Diffusing Units.

Although these lamps have been used with varying degrees of success for colour matching and in purely industrial applications, as, for example, the grading of leather, the grading of flour, also in chemical laboratories for judging the colour of precipitates, &c., they have not yet come into general use. Some attempts have been made to use them in shop windows, but invariably the cold effect produced is repellent. Lack of success in the use of these lamps is generally associated with one of two things: The light source itself is insufficiently concealed, or poor intensity of illumination. When the light is insufficiently diffused intense patches of deep blue are visible, which produce a psychological effect of coldness. The other cause of failure in these installations is due to the fact that the designer has not allowed for the absorption of light by the daylight bulb, and the resultant intensity is insufficient when compared with the light obtained under daylight conditions.

Recently the Lighting Service Bureau of the Electric Lamp Manufacturers' Association had occasion to provide artificial lighting for one of its smaller demonstration rooms. It was decided to try and produce, so far as possible, daylight conditions in this particular room, and, at the same time, afford a ready comparison between the lighting obtained in daylight, the lighting obtained from daylight lamps, and the lighting obtained from the ordinary gasfilled lamp.

Fig. 4 shows a section of the room under consideration, from which it will be noted that the daylight is obtained through a skylight. During the morning of a reasonably bright day in the winter 12-15 foot-candles of illumination are obtained on the table. A blind is arranged immediately under the skylight in order to exclude daylight. A diffusing glass screen is fitted flush with the ceiling, and above this, but below the blind, are installed 16 100-W daylight gasfilled lamps in mirror-lined troughs. There is no reason to suppose that alternative equipment, such as shop-window reflectors, &c., would not prove equally serviceable.

In the room itself four diffusing fittings are installed, each provided with one 100-W clear gasfilled lamp. Table I (overleaf) gives some information concerning the relative intensities of illumination obtained on the table.

Photographs were taken of the room under both systems of artificial lighting and natural daylight, and these are reproduced in figs. 1, 2 and 3. It will be noticed in the case of the "artificial daylight" that there is a complete absence of glare, and a maximum illumination is provided on lower surfaces, while the brightness of the walls diminishes as the ceiling is approached. This is typical of daylight, for invariably the maximum illumination is obtained on the floor, or in any case in lower parts of the room. The second photograph shows how this distribution of illumination in the room is completely reversed, and is particularly noticeable when the light and shade effects are considered. The lighting from ordinary lamps seems quite yellow when compared with that from daylight lamps, while that from the daylight lamps compares very favourably with daylight itself.

Fig. 2.—Lighting from Daylight Lamps above Skylight.

TABLE I.

TYPE OF LIGHTING.	INTENSITY.	WATTS.
Natural daylight	12-15 f.c.	—
Daylight lamps	15 f.c.	1600
Ordinary lamps in diffusing fittings	10 f.c.	400

So natural are the conditions produced by "artificial daylight" that an eminent assembly of engineers was entirely beguiled into the belief that they were holding their meeting under actual daylight, and were pleasantly surprised when, at the conclusion of their proceedings, they were informed of the true conditions.

Fig. 3.—Natural Daylight from Skylight.

It appears, therefore, that there is a considerable field for the use of illumination of this character, particularly if some satisfactory arrangements could be arrived at with electricity supply authorities regarding the cost of energy. For instance, such an installation in basement offices would be more valuable to the supply company from the point of view of revenue and constancy of

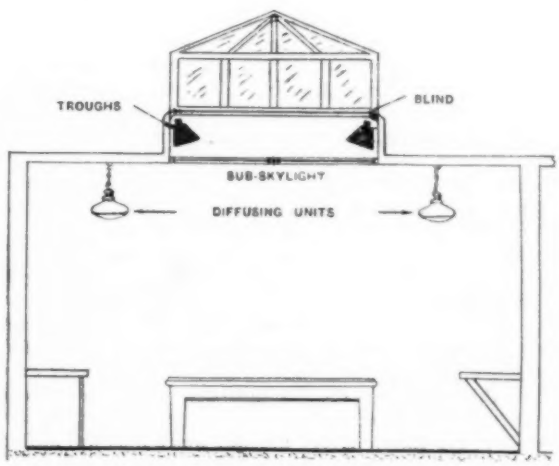


Fig. 4.—Section of Experimental Room.

load than an electric cooker, and the writer cannot see any reason why in such cases equally favourable terms should not be allowed. If this were possible the cost of lighting this room to the intensity and quality of daylight would only be 1.6d. per hour if the cost of energy were 1d. per unit, and the expenditure of these small sums should make it possible to improve the monetary and utility value of parts of buildings which at the present time command a comparatively low rental due to insufficient daylight.

"Cheapness" and Domestic Electrical Appliances.

By H. E. STRANACK.

THE columns of the technical papers and particularly the correspondence columns have recently contained statements in regard to an alleged public demand for "cheapness" in electrical fittings and appliances. Not only in those quarters, but amongst electrical dealers and contractors, particularly of the smaller or less pretentious type, there appears to be great timidity in approaching their customers with anything to which the adjective "cheap" cannot be applied. On being handed leaflets or literature concerning kettles, irons, toasters, simple electric light fixtures, bowl fittings or the like, at a manufacturer's establishment, the reply of such men is only too frequently: "Yes, this seems all right, but I'm afraid my customers will expect something a lot cheaper than any of these."

Again, where it is a question of the adoption of electric cooking, the question is so frequently put: "Will it be cheaper than gas?" or "How does it compare with gas?"—questions obviously unanswerable without a time limit in which the superiority or inferiority of the newer supplanting agent would have time to manifest itself. Of course, the fact that the retail purchaser asks such questions does not necessarily mean that he is going to refuse the adoption of electrical appliances if they are frankly stated *not* to be cheaper than the gas or other appliances which they are to supplant.

None the less, it may be well for dealers, contractors, and even manufacturers to ask themselves seriously whether or not they have not perhaps in their spoken arguments, used when effecting a sale or in advertisements, circular letters, &c., encouraged the public to ask for cheapness in electrical appliances much more than is justifiable when all the circumstances are taken fully into consideration, and whether they should not in the future leave this consideration out of their arguments altogether and carry conviction by stressing the excellencies or artistic, aesthetic, hygienic, labour saving and other predominant characteristics of things electrical.

It may not be amiss, in this connection, to reflect on what history has to teach us, after which I feel sure that we can safely make the assertion that progress has *not* been along the line of cheapness, but invariably *along the line of superiority*. That is why in our day (we can be optimistic) electricity is making headway in all departments of life; it may, of course, be cheaper in some, even in many directions—but that is not the reason for the advance and for its supplanting all other agents—that advance, and that supplanting are due to the excellent qualities mentioned above.

In support of this opinion, what then can we learn from the more or less recent past? Gas as an illuminant universally replaced candles and oil lamps—it was incomparably dearer, besides which, it had to be expensively installed and lacked the qualities of portability and of being self-contained possessed by its predecessors.

The writer is old enough to remember the introduction of typewriters into city offices; at first they were all one price, *viz.*, £25 each, and no one thought of claiming that they were cheaper than pens, ink and blotting paper. No! but they were a progressive step—therefore, they came and conquered.

Again, a very ordinary motor-car will cost at least twice as much in initial outlay as did, say, 30 years

ago, a pony and trap, and yet instead of there being fewer motors on the roads than there are horse-drawn traps, dog carts, &c., there are probably several hundreds to one.

One of the most successfully sold electrical appliances—the electric suction cleaner, supports this argument most strongly as its extensive sales have been reached not by offering it as being as cheap a contrivance as brooms and brushes, but by the frank admission that, whereas, those old-fashioned and inefficient implements only cost a few shillings, their electrical successor runs from thirteen to twenty-five guineas—in other words, it sells because of its superiority.

Instances could be quoted indefinitely, *e.g.*, the cost of the "push bike," beloved by the clerk or tradesman of the 'nineties, and the "motor bike" costing twelve times as much which his son somehow manages to be able to purchase

Most curious, perhaps, is this demand for cheapness when made by lady customers—I have often been told by a lady when showing her particulars and prices of domestic electric appliances that although they are no doubt good, yet they are so "frightfully" expensive as to be out of all question. To meet this, the electrical salesman must, of course, be able to draw attention to the "excellencies" of his goods, and by dint of persuasiveness and sound reasoning bring the lady to envisage the matter from the true point of view—which, in most cases, he will probably succeed in doing if sufficiently tactful. Artistic merit, utility, hygiene, all these qualities can be evaluated.

When selling an electric fire, it is quite permissible to point out that the family is going to sit round it in a semi-circle, that their eyes are going to rest upon it and, therefore, the less its design is akin to a sort of cross between a superannuated tombstone and an old-fashioned coal scuttle the better!

As a matter of fact, when asking for cheapness at the expense of aesthetic qualities, the modern woman forgets that she herself is a living contradiction of the principle involved. The red fox fur round her neck cost far more than the wrap which was employed to keep her grandmother's neck warm, and the same is equally true of her silken hose (several times the cost of the black stockings which they have replaced), and the dainty footwear as compared with the boots of preceding generations, all costing far more, yet successfully ousting the previous types.

The unnecessary acquiescence in this "cheapness" demand (instead of tactfully and skilfully explaining it away) leads, when we come to contracting work, to strange incongruities. The writer has seen a dining-room table costing, say, ten pounds, illuminated by a gimcrack and tawdry fitting costing, say, fifteen shillings, and he recently visited a clergyman's study which was lighted by a clear glass bulb lamp "shaded" by a very shallow 10-in. opal, the sides of which allowed the bulb to project with all its "glare" effect. What induced the technical electrician to install such a thing in such surroundings—nicely bound books, well upholstered chairs, and suitably framed pictures?

In conclusion, therefore, let us banish this "cheapness" fetish from our calculations, be prepared with the correct arguments to knock its backbone out whenever we meet it, and all of us "do our bit" to elevate electricity in the home to that dignified correspondence with environment that it enjoys in public buildings, large stores, banks, theatres, kinemas, &c., where this unreasonable craze has not been pandered to.

The Need for Accurate Costing—Why Wait?

A Suggestion for Speeding up the Incipient Trade Improvement.

(COMMUNICATED.)

THE recent decision of the Army Council to abolish the greater part of the short-lived system of departmental accounting, advocated by the Lawrence Committee, has brought down upon their heads a torrent of adverse criticism. Their action, showing their apparent distrust of this newly-instituted, but by no means untried, method of departmental financial control, has been incomprehensible to those who have had the opportunity to see and prove for themselves the advantages, and perhaps uncomfortably great possibilities of effecting economies, that may be provided by this system.

Members of the Lawrence Committee, prominent accountants, politicians, and many business men have all given vent to their feelings of disapproval, either at meetings or in letters to the Press, or otherwise. The Army Council have, apparently, but few supporters willing to stand up for them. However this may be, there is one aspect of the situation that appears so far to have escaped notice. Righteous though the critics may be in their attacks on the Army Council, much of its force might, with equal justice, have been directed against many of those who have the control of manufacturing industries in this country under their charge. Whether they be right or wrong, the attitude of the Army Council is far from unique, and not really very different from that of many of these manufacturers themselves, though the latter have not been slow to join in the chorus of criticism against the former.

As is well known, every business worthy of the name has its own set of cash books, purchase ledgers, sales ledgers, journals, and so on, in which are kept with scrupulous care, and by double entry, an exact and careful record of all receipts and payments of cash, cheques and bills of exchange; the utmost care is taken to see that no mistakes can creep unnoticed into these accounts, that no payments of the firm's money, or receipts on behalf of the firm can possibly occur without a corresponding entry in the appropriate account, and that the books always balance exactly. If it should happen that a balance cannot be struck at the first trial, then the mistake has to be found, no matter how small the amount may be.

The following instance, telling what recently took place in a large manufacturing firm, with two millions of capital, will suffice to illustrate the point. At the end of their financial year, when the books were balanced, they were found to be wrong by ten shillings. An immediate search failed to show where the error had occurred, and the accounts staff had to work overtime in order to find it. For four whole days, including three hours' overtime every evening, the search for the ten shillings that were lost continued, to the detriment of much of the ordinary routine work of the office. Every account was added up, and re-added up, checked and re-checked, until at last, on the fifth day, a shriek from a small girl working a comptometer adding machine heralded the announcement that a ten shilling mistake in the addition had been found. There is, of course, on this type of machine no typewritten record of its work, and consequently no means of comparing the figures fed to the machine with those in the ledger; probably because these machines were still an innovation in this particular firm, the glamour of their ingenuity had not yet worn off, and the possibility of an error in work done by them had never even been suspected, until in desperation a check of their results was ordered.

This, it is to be feared, is no exaggerated description of what takes place in many a counting house at the end of their financial year. It is cited here merely as an instance of the enormous importance that is attached to making the financial books balance absolutely, to the nearest halfpenny. The modern system of accountancy has been perfected to such a pitch that errors, even of negligible and insignificant amounts, have no place in the books of even the largest firm. There simply could not happen such a thing as a company presenting its balance sheet to the shareholders with a note of regret to the effect that the accounts were unfortunately found to be wrong by a penny, and that a prolonged search had failed to discover the missing coin! Yet one hesitates to think how many pounds it must have cost this concern in salaries, stationery, heating, lighting, not to speak of tempers, to find the penny that was lost. Regardless of time and expense, the financial accounts of all businesses are made to balance—in the end. Manufacturers, and other business men, all over the country, are in this respect unanimous with the Army Council. They are great believers in the powers of sound bookkeeping. All of them attach the utmost importance to proper and correct accounts, and, of course, no one but a fanatic would have it otherwise. Accounts, if they are to be of any use at all, must be correct, absolutely correct, and not even a penny out!

However this may be, the value of even correct accounts has, after all, its limitations. No matter how excellently or how accurately a firm may keep its accounts, this alone can be no criterion of successful business, or even of economical working inside the business. The fact that accounts can be shown to be a "true and correct view" of the financial position, does not also show that the money of the business has been well and wisely spent. A firm may have a model counting house staff, and the best auditors in the world, and yet be in a financially unsound position, merely because the business has been conducted uneconomically; for books of account, pure and simple, can safeguard only coin and credit.

Obvious though it may appear to all, the full significance of this limitation of accountancy seems to be but rarely understood. Because financial accounts do, in a most thorough manner, control the expenditure of the cash of a business by preventing any payments taking place without the personal knowledge or signature of a responsible director, this is often thought to be all the control of expenditure that can be necessary in a business. Such, apparently, is the view of the Army Council, which takes ample steps to satisfy itself that its budgeted expenditure is not exceeded in any direction, unless, of course, its special permission has been previously obtained. Such also appears to be the opinion of many directors of manufacturing concerns, who have provided themselves with a sufficient staff to keep the financial accounts of their business, but require no other check over expenditure.

It is proposed to show why it is that in the Army, as in business, financial accounts are themselves insufficient as a means of controlling expenditure in an economical manner, and wherein lies the remedy.

In every business, an enormous amount of time and care is invariably expended on the buying of raw materials, so as to obtain good quality and suitable material at a low competitive price; to obtain the best possible discounts, terms of credit and terms of delivery; and at the same time to guard against secret commissions at the expense of the business, and mistakes being made in the amount of money paid for materials. Thus far, but no farther, does the financial control provided by books of account proceed. Once delivered to the works, the material is handed over to the shops where it is used as required. It may be wasted, or it may not; it may be pilfered or it may not; it may be left lying about inside stores, or in the shops themselves, or even outside in the yard; it may lie there to deteriorate or rust away, and eventually be forgotten, or it may be used to good purpose. Whatever be its ultimate fate, there is seldom any evidence that it is someone's especial charge to find out how it is used. It certainly is not treated as if it were as valuable as money, for once in the shops, the control of the expenditure of material, though it may nominally rest in the hands of the foremen, or a storekeeper, is often either lax, or altogether non-existent. Even when some record of its use is kept, no great importance is attached to its accuracy, and still less to its balancing exactly like an account. If, at stocktaking, a few dozen pieces, or a hundredweight or two are missing, oh, well! it must have gone somewhere! the difference is simply written off, and no further thought or attention is given to the matter. Yet, when one comes to think of it, what difference is there between this material, and the money that is so jealously paid for it, but form and appearance? Why is such scrupulous care taken of payments of money to the suppliers for material, and so little of the material received in exchange? Why should the expenditure of money be so amply safeguarded, when the material, its equivalent in value, is treated with disregard? Why indeed? How, at all events, do these firms, at the end of the year, contrive to compute, to the nearest halfpenny, the value of their stocks on hand, in order to complete their balance sheets?

Much the same may be said about money paid for labour, in the form of wages. It would be interesting and illuminating to have some reliable statistician calculate the cost of wage agreement conferences during the past decade, for the sum must, indeed, be formidable. Wages are the life and soul of industry. If wages are too high, industry cannot stand the strain, and must eventually fail. If, on the other hand, wages are too low, the workmen cannot live and support their families. They do not give of their best work, and industry suffers again.

Many employers to-day will have it that wages are too high, and that improved trade can only come as a result of lower wages. They regard demands for increased wages or salaries as fantastical and out of the question at the present time; they even spend much of their own time in personally examining pay rolls with the intention of cutting them down, either by reducing the staff, or else reducing the rate of wages.

But in men who have been given their appointments, or engaged, personal interest, in so far as their work is concerned, is not always as keen. It is left almost entirely in the hands of foremen and heads of departments to supervise the work of the workmen and staff, and to see that the best use is made of the time for which they are paid. Little or no concern is caused by a queue at the stores window, or by extended perambulations on the part of men understood to be looking for tools, or going to fetch a drawing! Waiting for the crane, waiting for materials, or continual changing over from one job to another, and consequent waste of time in setting up and re-setting up machines, are all regarded as an inevitable part of the process of manufacture. A few exceptions there certainly are who see therein waste of money, a part of which, at all events, there is a chance of turning to better advantage.

How is it that the same praiseworthy care with which pay packets are made up, and handed out on Friday night, that is when the money is being spent, is seldom so much in evidence during the rest of the week, when its equivalent in time is being spent? What happens if a man finds at the end of the day that he has recorded on his time sheet how he has spent 8¼ hours instead of 8½ hours? Does he put in overtime until he has remembered how he spent the odd quarter of an hour, or does he just lump it in on to the job that will stand it best? So far as is officially known in most firms, such dilemmas simply do not arise! In a few others, they are prevented from arising.

Quite recently, the writer happened to come across an interesting example of this sort of thing in a firm where none of the directors was aware of the method by which overtime pay was calculated. It transpired that it had been the custom of the concern to pay overtime, at the rate of time and a third, for each quarter of an hour worked, so that if a man worked ¾ hour overtime, he received the equivalent of one hour's wage. If only part of a quarter was worked, then the nearest number of quarters of an hour was taken as the basis, thus: A man who worked 32 minutes was paid as for ½ hour, but a

man working 38 minutes was paid as for ¾ hour, and so on. If, however, 35 minutes was worked one night, and three minutes the next, ¾ hour overtime was paid at the end of the week, just the same as if the 38 minutes had all been worked on one night. The natural and inevitable outcome of this custom was that all those men who were actually required to work, say, 35 minutes, or 50 minutes, or some period just over the quarters of an hour, invariably took several minutes some other night in the week to find and don their coats, thereby getting paid for an extra quarter of an hour at time and a third!

Though all the directors of this company knew that overtime was paid at the rate of time and a third, no one of them understood how the time itself was worked out, until it was revealed by certain investigations carried out for the company by the writer. Though ample control over money was always kept in their concern, similar careful control over the time was neglected. This money-while-you-wait facility is no longer provided by the company.

Similar occurrences with regard to many of the other numerous expenses of a business such as rent, rates and insurance, can also be cited. Much time, thought and argument is invariably devoted to the amount of money that has to be paid for each, but little or none to the best and most economical use of the space obtained and insured with this money. It is the same with every expense of a business; the coin or cheque or bill given in exchange for labour, material or service, is checked and counted and safeguarded so as to admit of absolutely no leakage, but not so the labour, material, and services themselves.

Despite all that has been said, it does seem that somehow or other, it is reasonable to expect that the control of money spent should also render possible the control of the usages of what is bought for that money. Ample control of the one should somehow lead to the ample control of the other, since they are the equivalent of one another in value. Nevertheless, whatever may be expected in this direction, no one would presumably be willing to accept a low figure for rent as an indication of a well laid-out factory, or a small pay roll as a sure sign of hard-working and well-organised workmen. One is quite compatible with the other, certainly, but not a consequence of the other. The pay roll may be small because the men work well, and are equipped with time-saving devices and tools, so that a large output is obtained from a small staff, or, on the other hand, the number of men may be small because the business and its output are both small.

What is it then, that prevents this dual control? Clearly there is something important missing which must be provided before it is possible to decide the truth or otherwise of such propositions as these. A low rent may under certain circumstances be a perfectly sound indication of the economical use of floor space. It will, for example, indicate a well laid out factory IF the rent per unit of production is also low compared with other similar factories. Similarly, a low pay roll is a true sign of hard working, efficient, and well-equipped workmen IF the wages per unit of output are also low compared with similar businesses, but only IF these second conditions also hold good.

This explanation will, it is hoped, make clear what it is also necessary to do in order that control of money spent may give control over what is obtained for it, namely, to provide the "means of measuring" the pay roll, or the rent of the factory, against some common standard such as the output. Accurate accounts alone can never provide this control, unless accompanied by some such "means of measuring." Then it can be decided without fear of doubt, whether or not the rent is too high, or wages are too high, for their size matters not at all so long as the rent or wage per unit of production is reasonably low. To put it in another way, the control of the expenditure of cash in a business only provides ample and sufficient control over what is received in return for that cash, if some means can be provided of measuring the use made, or benefit obtained from what is received in exchange for that money.

It is just this means of measuring or comparing that is so often absent in a business. It was certainly absent in the company whose directors were unaware of the basis on which the overtime wages were calculated. It is certainly absent again now in the Army, and presumably nothing will now be heard of the officers and privileged civilians who get their private hunters shoed at farriery training schools with Government shoes, Government nails, and in Government time, in return for a moderate tip; or about payments made in return for work done by regimental tailors who use Government material and Government thread, and are paid by the Government for their time; or about the regimental shoemakers. . . The means of measuring has now been removed, and though the allowances laid down in the regulations and in Army Council Instructions will not be exceeded, they will doubtless continue to be paid in full regardless of whether services are obtained for them in full, or not. No one will any longer be able to measure payments made against work done.

(To be concluded.)

Water-Power in the Argentine.

Potential Value of the Mendoza District Rivers.

(From our Special Correspondent.)

IN no State of South America does there exist a more insistent demand for power generated on a commercial scale than in Argentina; it is needed for industrial plant (especially for the tramways) and the lighting of several rapidly-expanding cities. None of them can claim the usual advantage of occupying a location of natural water-power. All the large foreign-owned utilities companies employ electricity, and make use of imported coal as the source of energy. The utilisation of hydraulic power is therefore a matter of such supreme importance to Argentina that the Government has in its employment investigators and surveyors continually engaged upon search for suitable rivers which might be put to some commercial value.

Among the largest of the enterprises now being undertaken is the Hispano-Argentina super-power station; this will ultimately have a capacity of 500,000 kW, consuming daily 4,000 tons of coal, which it is proposed to use in a pulverised state.

A district hitherto little regarded as of potential value, but which now promises to become of some considerable worth from a hydraulic power point of view, is the mountainous part of Mendoza, which contains some of the highest summits of the Andes. Here, also, are several rivers which, as recent investigation shows, could be effectively harnessed to provide a large volume of power. Unfortunately, the amount of capital that would be required cannot be provided by the State alone, so that any enterprise would have to be undertaken by private or combined interests—private and State.

Towards this end, the Government has expressed its willingness to co-operate; or, alternatively, it is prepared to grant a concession upon certain terms.

A scheme which has recently been made the subject of special study relates to the harnessing of the waters of the Rio Atuel. The river runs strongly from the south to the north-west of the Mendoza province, following an unbroken course over several hundreds of miles of

rocky and at present profitless territory. As the river approaches the town of Nihuil, however, at a distance from the city of Mendoza of about 300 miles, the rocky formation abruptly changes, the waters of the river narrowing between the precipitous walls of a deep cañon. There then comes a sudden drop, forming a waterfall 310 feet in height, and extending over a distance of, roughly, some 550 feet. The flow, which in flood time is estimated at 550 cubic yards a second, has an average all-the-year-round discharge of 450 cubic yards per second.

The location is considered highly favourable for the erection of a large generating plant, estimated to produce between 40,000 and 100,000 h.p. of electrical power. By damming the river, thus providing an even flow throughout the full year, sufficient irrigation waters could be obtained to serve more than 600,000 acres of land—at present little better than desert—in the southern portion of the Province. Electric power for lighting and industrial purposes could be both easily and cheaply sent to the fast-growing city of Mendoza and supply, additionally, the flourishing residential suburbs which are extending around it.

Nearly four years ago, following an investigation made by the State Engineer into the possibilities of the Mendoza waterfall, the Minister of Public Works of the Province of Mendoza offered to grant a concession for the installation and operation of hydraulic plant at Nihual, upon the following, among other, conditions: the concessionaires were to commence and bring to completion a scheme of whatever kind the Mendoza legislature—after taking technical advice—might determine upon. The sole compensation offered to the concessionaires was the right to operate commercially the plant for their own account over a limited number of years, not specified in the first announcement. At the end of the period determined upon, the plant and installation would be delivered in good working order to the perpetual ownership of the provincial government of Mendoza. Before operation of the plant could be commenced, a tariff of charges for the supply of light and power would have to be drawn up and submitted to the Legislature for approval; application for continuance would have to be renewed every five years. A certain percentage of the financial receipts would also have to be paid to the province. A deposit of $100,000 (paper) would be made as a guarantee for faithful compliance with the terms of the contract, upon which work must commence six months after signatures had been attached. Upon its part, the Provincial Government would exempt the concessionaires from taxes and imposts of all descriptions during the life of the concession, and would also undertake to expend a maximum sum of $10,000 for the purpose of making the preliminary studies and topographical surveys.

In view of the extremely one-sided terms of the proffered concession, it is not difficult to understand the small interest aroused.

The Mendoza power scheme, however, is but one among many hydraulic enterprises that are possible in Argentina, inclusive of the Iguazú Falls enterprise, to which reference has already been made in the columns of this journal. Since that article appeared, a United States firm of hydraulic engineers, it has been reported, has expressed itself ready to carry out a scheme with the view of conveying 300,000 h.p. from the falls of Iguazú to Buenos Aires, at a cost not exceeding 60 per cent. of the present cost of electricity.

Electricity Recommendations at Southend.—In a report to the Southend Town Council on its electricity undertaking, Mr. J. H. Rider recommends, *inter alia*, the erection of a new steam power station at South Fambridge to supply Southend as well as a large area to the north of the borough, and that as soon as this station is ready the Diesel engines at the Leigh and Thorpe power stations should be abandoned entirely. He further recommends that a fourth Diesel engine should be installed forthwith at the London Road power station to maintain the supplies until the new station is at work, and that the Diesel plant at London Road should be kept in service for a number of years to work in conjunction with the new power station during peak load periods.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Abu Zabal Wireless Station.—On June 10th, Lord WOLMER informed Mr. Ammon that negotiations for the sale of the Abu Zabal wireless station had reached an advanced stage, but the transaction had not yet been completed. He was not, therefore, at liberty to disclose the proposed purchase price or the conditions on which the sale would be effected.

The Finance Bill.—On June 8th, during the Committee stage of the Finance Bill, Mr. FENLY moved that the "safeguarding" duty on imported arc lamp carbons should be 3d. instead of 1s. per lb., as proposed in the Bill. The amendment was defeated by 245 votes to 135.

Mr. PETHICK-LAWRENCE moved to omit from the "safeguarding" duties amorphous carbon electrodes (not including primary battery carbons or arc lamp carbons). This was defeated by 240 votes to 128.

Mr. LIVINGSTONE moved to omit "vulcanising paper" from the scope of the new "safeguarding" duties on paper. He said that vulcanising paper was a raw material which was very essential and important for the electrical industry.

Sir B. CHADWICK, Parliamentary Secretary to the Board of Trade, said that vulcanised paper was produced in this country, and that was why a duty was put on the imported article.

The amendment was negatived by 225 votes to 127.

Slack for Electricity Undertakings.—On June 7th, Mr. LANSBURY asked the Secretary for Mines whether he was aware that certain coalowners and others were offering for sale large quantities of slack and waste deposits lying in and around the pits to electricity undertakings, such undertakings being the only industries which under great difficulties were able to utilise that waste; that those deposits were, in the ordinary course, considered of no value and were written off as a loss; and would he consider the advisability of using his powers under the emergency powers regulations to take over the heaps of slack piled up in mining areas, and so prevent exploitation in this respect.

Colonel LANE-FOX said that one or two complaints about the prices charged for slack had reached him, and he was looking into them. He was quite prepared to consider exercising powers under the Emergency Act to requisition coal or control prices if, in the last resort, this should prove necessary for the protection of the consumer.

Communication with Australia.—On June 8th, Sir A. SINCLAIR asked the Postmaster-General whether, in view of the statements by the managing director of Amalgamated Wireless (Australasia), Ltd., that Australia had stations capable of conducting experiments in radio-telephony with those in this country, that the stations were ready, and that they were willing to co-operate upon receipt of an invitation from Great Britain, he would say whether that invitation would be extended; and, if not, for what reason.

Sir WM. MITCHELL-THOMSON said he had communicated with the Australian authorities and he understood that the Australian company had no stations which could undertake suitable radio-telephonic transmission to this country. Two-way experiments were therefore impracticable; but they had offered to receive the experimental transmissions from Rugby and to report their strength. He had informed them that he welcomed the offer, and he had furnished the necessary particulars of the Rugby transmissions. Unfortunately it had been necessary to suspend the Rugby experiments during the present emergency.

G.P.O. Services.—On June 8th, Col. DAY asked the Postmaster-General what was the estimated surplus or deficit on the postal, telephone, telegraph, and wireless services for six months.

Sir W. MITCHELL-THOMSON said that the estimated figures in respect of the six months ended March 31st, 1926, were as follows:—Postal services, surplus £4,229,000; telephone services, surplus £250,000; telegraph services, deficit, £774,000. The figures in respect of radio services were taken into account in estimating the total deficit of £747,000 for telegraphs. Separate figures for radio services for a recent period were not available.

London Electric and Metropolitan District Bill.—The Bill promoted by the London Electric and Metropolitan District Railway Companies came before the Unopposed Bills Committee of the House of Commons on June 11th. It was explained that the object of the Bill was to provide for the widening of lines, the installation of escalators and other works, at an estimated cost of £2,400,000, and to enable the companies to raise additional capital, not exceeding £1,000,000 in the case of the London Electric Railway and £500,000 in the case of the Metropolitan District Railway. The preamble was passed and the Bill ordered to be reported to the House for third reading.

Swindon Corporation Bill.—This Bill, which contains clauses empowering the Corporation to carry out wiring itself and to sell fittings and appliances, came before the Unopposed Bills Committee of the House of Commons on June 11th and was ordered to be reported to the House for third reading. By agreement a number of provisions to safeguard the position of local electrical contractors were inserted in the Bill.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Trade Names Supplement.—Along with our issue of next week we shall publish the first of a series of four Quarterly Supplements of Electrical Trade Names. These will contain the names and addresses of manufacturers and suppliers of a large number of electrical products and materials which bear special Trade Names. Each Supplement will be distributed free to every one of our 13,000 readers at Home and abroad, and will enable them to get into direct touch with the maker of any article included in the List.

The "Electrical Review" Index.—The Index to Vol. XCVIII (for the half-year ending June 30th, 1926), will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made at once to the Publisher, 4, Ludgate Hill, E.C.

New Argentine Company.—The *Review of the River Plate* records the formation of the Cia. Feba de Electricidad in Buenos Aires, with a capital of $500,000 m/n, "to manufacture, import, and deal in electrical and sanitary machinery and articles in general." The company takes over an existing business.

E.D.A. Activities.—The British Electrical Development Association has published a folder containing reproductions of advertisements which appeared in daily, weekly and monthly papers, with a combined circulation of over 17 million per issue, during the period October, 1925, to March, 1926. The advertisements were specially designed for the various classes of journal in which they appeared and as a result their appeal was greatly strengthened and they must have performed a great deal of useful service for the electrical industry and the public at large.

Unemployment.—There was an increase of 16,521 in the number of registered unemployed during the week ended May 31st, bringing the total up to 1,614,200, as compared with 1,247,306 at June 1st, 1925. The total does not include persons who ceased work in the coal-mining industry on account of the lock-out.

A "Mazda" Display.—The accompanying picture shows a car which took part in a recent Shopping Week procession

A "Mazda" Display at Hendon.

at Hendon. It was arranged by Mr. C. E. Keates, a Hendon electrical contractor, and "featured" "Mazda" lamps in a very prominent manner.

Wages in the Engineering Industry.—The Federation of Engineering and Shipbuilding Trades held its annual conference in Bristol last week. Mr. W. Sherwood, in his presidential address, said a national strike was futile and wasteful, because it could never succeed. It could only be complete if all workers ceased to produce or distribute commodities, and that would result in terrible privation, if not starvation, for the poorer paid workmen with no reserves. If the discipline and enthusiasm shown in the general strike were directed to a closing of the ranks of labour, the abolition of differences between craft and labour organisations, and the establishment of a great and powerful trade union movement, the cost and sacrifice would be worth the effort. The conference decided to apply for an advance of 10s. a week on the existing rates of wages of all workmen engaged in the shipbuilding industry. Determination was expressed to get higher wages in the engineering industry, while it was hoped that satisfactory conclusions to the negotiations proceeding for an advance of 20s. a week would be reached.—*The Times.*

A Hotel Lighting Installation.—The First Avenue Hotel, London, has recently been re-opened after undergoing "spring cleaning" on a very large scale. It has been completely re-furnished and re-decorated and among the improvements carried out is a new lighting installation. Massive real bronze fittings and "Superlux" glassware designed and supplied by the General Electric Co., Ltd. and fitted with "Osram" gasfilled lamps are the leading feature of the instal-

The Lighting of the First Avenue Hotel.

lation in the main entrance and lounge. The entrance is illustrated in the accompanying figure. In other parts of the building similar elaborate fittings are employed. The main staircase is illuminated by ten "Unalux" fittings finished in gilt with decorated glassware. Over 1,000 lamps have been supplied, including 400 "White Osrams" and colour-sprayed lamps.

League's Assistance in Austrian Electrification.—In his latest report the Commissioner-General of the League of Nations for Austria states that in order to provide work for the unemployed on productive investments he has accelerated the rate of grants for this purpose. Included in the work is electrification for which two advances of 3,010,937 schillings and 3,643,950 schillings respectively have been made this year, bringing the total advanced for this purpose up to 12,193,950 schillings.

Portable Generating Set Contracts.—MESSRS. STUART TURNER, LTD., Henley-on-Thames, have received from the Air Ministry an order for a 1½-kW generating set for the triple purpose of general camp lighting, supplying searchlight current and low voltage current for battery charging. One generator supplies the three voltages and a special switchboard is mounted on the set. The engine is the standard type F.S.1 3-b.h.p. petrol engine made by the firm for its 1½-kW generating sets for country house lighting, the only difference being that aluminium is employed for the sake of lightness. The company has also received a further order for 80 small sets from the Post Office. These are for village automatic telephone exchanges. The Post Office has already installed over 200 of these sets.

Trade with Ireland.—We are informed that a movement is afoot among business men who are interested in trade with Ireland to form a special section of the London Chamber of Commerce for the sole purpose of furthering trade with the Free State and Northern Ireland. Further information can be obtained from the Secretary of the London Chamber of Commerce, 97, Cannon Street, E.C.4.

Electricity in the Balkans.—The Jugo-Slavian press agency "Sava" states that the municipality of Krouchevatz in Serbia, intends to construct an electric power-house in the town and that to this end it is open to receive tenders. It is calculated that the setting-up of this station will cost about eight millions of dinars (about £30,000). German, French, Austrian, and Swiss firms are all interested in projects for electrification in Jugo-Slavia.

Social Events.—The staff and employés of Messrs. A. Reyrolle & Co., Ltd., held their fifth annual sports meeting on June 5th at the company's own recreation ground; the attendance was approximately 2,000. Music was provided by the Hebburn Colliery Prize Band and the proceeds from the gate receipts are to be handed over to the Hebburn Infirmary. The prizes were presented by Mrs. H. W. Clothier. The Works Sports Management Committee, of which Mr. H. W. Miller is the chairman, arranged the programme, and attended to the comfort of the employés and their guests.

The Football Section of the General Electric Co.'s Sports Club held a dinner at Pritchard's Restaurant, W., on June 4th. Mr. L. C. Gamage presided, and he and Mr. M. Railing, who was also present, congratulated the teams on their successes during the past season. A number of speeches were made and an excellent musical programme was provided.

Local Exhibitions.—MANCHESTER.—The Electricity Committee has arranged for one of the electric houses on the Burnage Estate to be open for inspection by the public from June 14th to July 10th.

WEST HAM.—*Correction.*—We regret that our last week's note on the forthcoming electrical exhibition at West Ham, stated that it was being held during the current week, when in fact the show is not until September 13th.

ST. HELENS.—Mr. F. N. Rendell-Baker, the St. Helens borough electrical engineer, has sent us photographs of an exhibition which was arranged recently in the Y.M.C.A. Buildings, St. Helens. We reproduce one of these showing a comprehensive display by the General Electric Co., Ltd., in which practically every class of domestic appliance appeared.

The St. Helens Electrical Exhibition.

Our Foreign Trade.—The following were the values of imports and exports of electrical goods and machinery during May :—

	May, 1926.	Inc. or dec.	5 months, 1926.
Imports—	£	£	£
Electrical goods and apparatus	188,658	– 86,539	– 370,114
Machinery	1,049,459	– 15,974	+ 463,160
(Electrical machinery)	80,996	– 18,299	– 15,377
Exports—			
Electrical goods and apparatus	733,053	– 428,580	– 905,678
Machinery	3,184,520	–1,205,646	–1,536,688
(Electrical machinery)	425,183	– 121,555	– 204,032
Re-exports—			
Electrical goods and apparatus	8,938	– 19,710	– 41,491
Machinery	71,051	– 76,255	– 74,430
(Electrical machinery)	2,449	– 3,160	+ 6,411

The Amalgamated Engineering Union.—It is stated in its June *Journal* that the Union proposes to establish an "industrial section" which would cater for all classes of engineering workers over 16 years of age not at present eligible for membership of the Union.

Swedish Trade with Russia.—The *Board of Trade Journal* reports that the very considerable fall in Sweden's exports to Russia during 1925, due to the cessation of exports of locomotives, was partly offset by larger shipments of separators, ball bearings and electric generators. On the other hand, the exports of water turbines, which in 1924 were valued at 3.3 million kronor, were insignificant in 1925.

South African Electrical Imports.—The foreign trade statistics of the Union of South Africa for the year 1925 show that the imports of electrical machinery reached a value of £1,175,990, as compared with £1,078,114 in 1924.

"Your's the Companey"!—An electrical manufacturing company recently received the following application for employment. Comment would spoil so choice a specimen :—

"Dear Sir,

I have a very great pleasure of sending you this letter. For asking your settlement on the Electrical Sub Stations in all part of this Countrey in North Wales the Frawsfynudd Lake supply. Your's the Companey. Will you give me an opportunity of coming to this Electrical Works in this stations the nearest station to me is that station on a hill near Penrhyndeudraeth. I am live within 1¼ M to the Station, I am very interesting in the Electrical Instrument, Electric Generator's.

"I am 20 years of age. I like to Apprentice with you i am in a study every night with Electrical Powers and so on. Well i must come to a close now with thanks i waiting for a letter soon from you Yours trulley,

_____."

Trade Announcements.—The NON-FERROUS DIE CASTING CO., LTD., has removed its showrooms and offices to 36, Grosvenor Gardens, S.W.1.

The JEARY ELECTRICAL CO., LTD., of 26-28, Lambs Passage, Chiswell Street, London, E.C., announce that their business has now been reorganised. A trade price list of electrical accessories has been issued.

MESSRS. BRUCE, DAWSON & CO., 70, Finsbury Pavement, E.C.2, inform us that they are the agents in Great Britain, Ireland, &c., for the electric damping iron described in our issue of June 4th. The iron has been sold for some time past under the name "Elda."

Catalogues and Lists.—THE EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—A pamphlet giving particulars and prices of "Ediswan" electric fans.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—June stock list of motors and dynamos.

MESSRS. SPENCER (MELKSHAM), LTD., Melksham, Wilts.—A brochure dealing with the company's goods-handling equipment.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Bulletin No. 34, containing particulars of "Pul-syn-etic" time-recording systems for works and offices, sirens, bells, &c.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for May, containing profusely illustrated descriptions of "Osram" lighting installations and dealing with the company's valves, fans, &c.

MESSRS. HENRY JENKINS & SONS, LTD., Vittoria Street, Birmingham.—Four catalogue sheets bearing illustrations and prices of canopy fittings for electric lighting.

THE HARLAND ENGINEERING CO., LTD., Alloa, Scotland.—Publication No. 507, describing a.c. motors complying with British Standard Specification No. 168/1923, ranging from 1 to 60 b.h.p., for general industrial purposes.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., U.S.A.—A series of illustrated leaflets dealing with air-break disconnecting switches, centrifugal oil separators, "Repel-Arc" furnaces, induction motors, baking ovens, and electric solder pots.

MESSRS. H. W. SULLIVAN, LTD., 368 & 369, Winchester House, E.C.2.—A comprehensive list of precision d.c. measuring and testing apparatus for laboratories and test-rooms. Fully illustrated and priced.

THE CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Road, S.W.1.—A mailing card showing the situation of the company's instrument repairing depots in Great Britain and Northern Ireland.

MESSRS. J. H. SANKEY & SON, LTD., Essex Wharf, Canning Town, E.16.—A booklet and postcard dealing with "Pyruma" plastic fire cement.

THE REES ROTURBO MANUFACTURING CO., LTD., Wolverhampton.—Pamphlet R.232, illustrating and describing in detail the company's self-contained pumping sets; and Pamphlet R.233, dealing with pumps for acid liquor and chemical trade liquids.

NEW PELAPONE ENGINE CO., LTD., 41, Baker Street, W.1.—Booklet No. 150 and Price List No. 152, containing particulars of the company's small generating sets.

MESSRS. HOUGHTON-BUTCHER (GREAT BRITAIN), LTD., High Holborn, W.C.1.—A price list of radio sets and accessories, including a "special bargain bulletin."

MESSRS. HICK, HARGREAVES & CO., LTD., Soho Iron Works, Bolton.—An illustrated brochure describing surface condensing plant incorporating the "Hick-Breguet" ejectair.

Bankruptcy Proceedings.—GEOFFREY MELLOR, 59, New Oxford Street, W.—This debtor attended at the London Bankruptcy Court on June 11th for public examination, upon accounts showing liabilities of £450 against assets valued at £379. He stated that from October, 1923, till November, 1924, he was employed as a traveller by Neutron, Ltd., a wireless company. In the last named month he commenced business as agent for manufacturers of radio apparatus at Vernon House, Sicilian Avenue, E.C., under the style of "Mellor." He obtained supplies of raw materials and sold them to Neutron, Ltd., who, in return, supplied "Mellor" with manufactured goods for sale on commission terms. Witness closed the business last August and acted as director of Detex, Ltd., which was then formed to deal in a crystal produced by himself. That company went into voluntary liquidation in February last. Since then he had been employed as manager of a limited company engaged in dealing in radio apparatus. He attributed his insolvency to his inability to collect moneys owing to him. The examination was concluded.

C. H. PATRICK, 132, Much Park Street, Coventry, electrical contractor and wireless dealer.—The public examination of this debtor was held recently at the County Hall, Coventry. After questions had been put the examination was adjourned. Trustee, Mr. W. Hand, 12, Cherry Street, Birmingham, appointed June 2nd.

H. C. HALL, electrical and fancy goods dealer, "The Pantechnicon," 5, Chapel Street, Penzance.—First meeting held June 16th, at the Official Receiver's office, 12, Princes Street, Truro; public examination, July 19th, at the Town Hall, Truro.

R. HAMPSON (lately trading with A. Mearns as the Northern Supply Co., of Bolton), electrical engineer, Yew Tree Bungalow, Hall-i'-th'-Wood, Astley Bridge, Bolton.—Receiving order made June 8th, on debtor's own petition.

P. L. SYMONS, electrician, 4, Nelson Road North, and 4, Victoria Road, Great Yarmouth.—Trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich, released, May 27th.

H. TIDSWELL (H. Tidswell & Co.), electrical engineer, 54, Trennant Road, Irlams-o'-th'-Height, and 11, Bazaar Street, Pendleton.—Last day for proofs for dividend, June 26th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

Company Liquidations. — WAINWRIGHT MANUFACTURING CO., LTD., Walthamstow, E.17, wireless and electrical manufacturers, &c.—A meeting of creditors was held on June 10th, at the Institute of Chartered Accountants, E.C., when the chair was occupied by Mr. Vincent (Messrs. Vincent and Goodrich, C.A.), the liquidator of the company and the receiver for the debenture holders. A statement of affairs was presented which showed liabilities of £3,167, all due to unsecured trade creditors. There was a fully-secured creditor for £35 and debentures and interest amounting to £2,115. The net assets were £788, leaving an estimated deficiency of £2,378. The liquidator said that the company was formed to execute various contracts, and at the time of the incorporation no manufacturing was done. After about three years' trading the company decided to manufacture radio parts, and removed to Walthamstow. The first directors of the company were Mr. E. Wainwright and Mr. S. W. J. Vaisey. On December 6th, 1921, Mrs. Wainwright was appointed a director, and early in 1922 Mr. Vaisey resigned his position on the board, and Mr. H. A. Machin was appointed in his place. The liquidator said that the expenses had been far too heavy. In reply to questions he said that the wireless business had decreased very considerably during the last year; a patent table which the company had taken up was not the property of the company, but belonged to Mr. Wainwright and another gentleman. He (Mr. Vincent) was appointed receiver on May 25th, 1926. It was resolved to appoint a committee of inspection, consisting of the three principal creditors, to act with Mr. Vincent in the voluntary liquidation of the company.

The following are creditors:—

	£		£
Siemens & English Electric Lamp Co., Ltd.	483	Barnes, C. A.	53
Siemens Bros. & Co., Ltd. ...	432	Davis & Timmins, Ltd.	49
Hervé, L., Ltd.	261	Ryman, H. J., Ltd.	47
Wilson, J. R.	174	Streeter, J.	45
Walton Harvey Ltd.	159	Moy, E. F., Ltd.	41
Ever-Ready Co (Gt. Britain), Ltd.	113	Lowenadler, F. W., (Sundries), Ltd.	38
Sifam Electric Instrument Co.	101	Edison Swan Electric Co., Ltd.	36
Ferranti, Ltd.	97	True Thread Screw Co.	35
Igranic Electric Co., Ltd. ...	96	Gillet Bros., Ltd.	29
Robinson & Sons	90	Brands, Ltd.	26
Holmes Bros. (London), Ltd. ...	84	Pettigrew & Merriman, Ltd. ...	24
Norfolk Studios, Ltd.	58	Telegraph Condenser Co., Ltd. ...	23
Birkbys	54	Burnham & Co.	21
Benjamin Electric, Ltd.	53	*Wireless Dealer*	21

B.M.A.S., LTD., Ashburton Road, Old Trafford, Manchester.—The first meeting of creditors was held on June 7th, at the Official Receiver's Offices, Manchester. According to the statement of affairs the gross liabilities as regarded creditors were put down at £35,840, against total assets of £10,829, leaving a deficiency of £25,011. As regarded contributories the deficiency was estimated at £47,211. The failure of the company was attributed to a falling off in the demand for accessories. The company was incorporated privately in January of last year, to carry on business as manufacturers of electrical ignition apparatus and meter accessories, with head offices and works at the above address, and with depôts for sales and repairs in 11 places in England and Ireland. It was formed to continue the business previously carried on by another company. The total debenture issue was £24,000 and the amount owing to the bank was £24,401. The Official Receiver expressed the opinion that further inquiry into the formation of the company and of the conduct of its business was desirable. The case was left in the hands of the Official Receiver with a committee of inspection.

BRISTOL & SOUTH WALES ELECTRIC WELDING CO., LTD.—Winding up voluntarily. Liquidators, Mr. J. W. Williams and Mr. P. Jones, 5, St. Andrew's Crescent, Cardiff. A meeting of creditors is called for June 21st at the offices of the Liquidators. Particulars of claims by July 28th.

FRANK CRAFT (CASTLEFORD), LTD.—Meetings of creditors and contributories June 22nd, at the Official Receiver's office, 21, King Street, Wakefield.

LYDBROOK CABLES, LTD.—Winding up voluntarily. Liquidator, Mr. F. V. Hasemore, 123, Queen Victoria Street, E.C.4. Particulars of claims to the Liquidator by June 25th.

SOUTHERN RADIO SUPPLIES, LTD.—A meeting of creditors was held on June 9th, at the offices of the liquidator, Mr. P. M. Jones, Terminus Road, Eastbourne.

Private Arrangements.—T. W. BROOKS, trading as Brooks and Clayton, electrical and wireless engineer, 72, Belgrave Road, Leicester.—A meeting of creditors was held recently, when a statement of affairs was submitted which disclosed liabilities of £489, all due to the trade. In addition, there were fully secured creditors for £348, who held securities valued at £360, leaving a surplus of £11. The net assets amounted to £615, leaving a surplus of £125. It was stated that the assets were shown on the basis of a going concern and were subject to realisation and costs. Further adjustment might also be necessary. Mr. Brooks commenced business on his own account in June, 1922, with £30 capital. In 1924 Mr. Clayton joined him in partnership, putting £140 into the concern, while Mr. Brooks put in a further £130. In November, 1925, Mr. Clayton left the business. A full set of books had not been kept until this year. It was resolved that a committee of inspection should be appointed consisting of Messrs. Gilbert & Co. (Sheffield), Mr. Tames (E. H. Wood, Leicester), Messrs. Wathes & Co., Ltd., and Mr. C. Latham, of the Wireless & Radio Trades Guardian Association.

J. F. DARE, ironmonger, wireless and electrical engineer, 4, The Parade, Tadworth.—The creditors interested herein were called together on June 8th, at the offices of Messrs. Theodore Bell & Co., London, E.C., when Mr. Bell reported that the liabilities to unsecured creditors amounted to £525, and there were preferential and other claims amounting to £40. The assets consisted of book debts £13 and stock valued at £300. Mr. Bell added that there was a cash creditor for £250, but in the event of the estate being dealt with privately that claim would be withdrawn. The debtor said that he had been in business about 12 months. He had kept no books. He attributed his position to losses on trading chiefly in the radio trade, having installed sets and guaranteed them for six months. It was decided that a committee of creditors should be appointed and endeavours made to sell the business as a going concern.

W. LANHAM MAYS, 91, Southampton Row, W.C., electrical engineer.—A meeting of creditors was held on June 11th, when Mr. W. A. J. Osborne presented a statement of affairs which disclosed liabilities of £655 and net assets of £118, leaving a deficiency of £537. Mr. Osborne reported that the debtor started business in partnership with a Mr. Short in 1920. He borrowed £250 from his brother and opened offices in the Strand, and also at Tottenham. In 1922 Mr. Short retired from the business. The loan of £250 was repaid, but in March, 1925, was borrowed again in order to enable the debtor to start his present business. The turnover since March, 1925, had been approximately £1,500, and the debtor estimated that he had made roughly 20 per cent. profit. The expenses were £259, and the debtor had been drawing at the rate of £500 per annum. There were no private assets. It was resolved that the debtor should execute a deed of assignment in favour of Mr. W. A. J. Osborne as trustee, provided the cash creditors withdrew their claims.

The following are creditors:—

	£		£
Alliance Wholesale Electric, Ltd.	73	Sloan Electrical Co.	83
Metro-Vick Supplies, Ltd. ...	65		

Dissolutions of Partnership.—ALLAN & MEGGITT, electrical engineers, Canford Hall, St. Peter's Road, Bournemouth.—Mr. J. C. Allan and Mr. S. T. Meggitt have dissolved partnership. Mr. Meggitt will attend to debts and continue the business in his own name.

READING RADIO INSTALLATIONS, dealers in radio supplies, 17, King's Road, Reading.—Mr. A. Williams and Mr. A. Phillips have dissolved partnership. Debts will be attended to by Mr. Phillips, who will continue the business.

LEWIS & MAYER, electrical engineers and contractors, Subway Road, Barry Dock, Glamorgan.—Mr. H. E. B. Lewis and Mr. E. T. Mayer have dissolved partnership. Mr. Mayer will attend to debts.

Lead.—In their report dated June 12th, Messrs. James Forster & Co. stated that considerable buying by cable makers caused the firmness in tone early in the week:—"Apart from the lead already in warehouse, the position of supply and demand seems to be pretty evenly balanced. Consumption in this country is of course being curtailed by a shortage of fuel, but, on the other hand, this is being made up for by a better demand from the Continent, there being a shortage of lead in Germany. A satisfactory settlement of the coal dispute and normal fuel supplies for consumers here would probably bring out a good demand for lead, particularly for near delivery, and it is doubtful whether there would be enough lead arriving within the next month to meet this demand. On the other hand, it must not be forgotten that there is plenty of lead in warehouse and this would no doubt make its appearance on any sign of a shortage of arrival lead."

Syrian Customs Duties.—The *Board of Trade Journal* states that by a recent decree the rates of Syrian import duties on most goods were increased. The date of the coming into force of the new tariff has been postponed until July 1st. The duties generally are increased from 15 to 25 per cent. *ad valorem* but a number of specific rates have been instituted. These include a duty of 40 piastres (gold) per hundred on electric batteries for pocket torches.

Irish Free State Electrical Imports.—The imports of electrical goods, excluding machinery, into the Irish Free State during April last amounted to £30,312, as compared with £25,785 in the same month a year ago. The imports for the first four months of the year are officially returned at £159,499, as against £99,189 in the corresponding period of 1925.

The Licensing of United States Contractors.—All master electricians doing wiring in the city of Kingston, N.Y., now have to file a $500 indemnity bond, pass an examination and pay a $10 licence fee. This is provided for in an amendment to a city ordinance, passed by the Board of Fire Commissioners of the city on April 13th. The Board of Examiners, which will pass on the qualifications of electricians applying for licence, will be composed of the chief of the Fire Department and two members appointed by the president of the Fire Commissioners.—*The Electragist.*

Book Notices.—"Electrical Contracting," by H. Ayres Purdie. Pp. xxxii + 371; figs. 186. London: Ernest Benn, Ltd., 1926. Price, 10s. 6d. net.—The data and information required by the average electrical-contractor is of a varied nature and is usually to be found scattered in a number of publications. The author has made an attempt to put all the necessary information under one cover and the result, in the form of the above book, should prove useful to the electrical contractor, particularly to the man in a small way of business who is employed most of the time on ordinary domestic installation work, but occasionally has to meet conditions where unusual data are required, the small amount of such work not enabling him to draw up the necessary particulars for his own use. The work is divided into six parts, the first of which is devoted to the organisation of an electrical contracting business and should be of value to the contractor when first starting. Many useful suggestions are made concerning capital and credit, business registration, works orders, the requisition of materials, costing, &c. Considerable space is given to the question of advertising and salesmanship, and also to the drawing up of estimates and specifications. The second part, administration, deals with the control of the staff, the issuing of orders and the adherence to the rules and regulations laid down by authoritative bodies such as the Institution of Electrical Engineers. The remaining chapters are concerned with the actual work done by contractors. The various systems of wiring, with recommendations for particular installations, are outlined and many types of apparatus are described and illustrated. A number of diagrams of connections and wiring for installations and apparatus are also included. In an introduction to the book, Mr. J. C. Elvy, A.M.I.E.E., says: "I know of no other single book covering so much ground in electrical contracting work."

The Association of "Old Cromptonians" (Mr. M. Whitgift, hon. sec.), has issued a neat brochure dated May, 1926, containing a list of members, amusing "cataclysms" by J. W. Meares, and "Chelmsford Notes."

"Memoirs of the College of Engineering," Kyoto Imperial University. Vol. IV, No. 2, March, 1926. "The Fatigue of Steel and its Recovery," Part I.

Catalogue of the Collections in the Science Museum, South Kensington. Electrical Communication.—1. "Line Telegraphy and Telephony." Compiled by R. P. G. Denman, M.A., A.M.I.E.E. Pp. 55, illustrated. H.M. Stationery Office. Price 9d. net.—Descriptive and historical notes accompany the items, many of which are illustrated.

Receiver Appointed.—A receiver and manager has been appointed in the Acme Production Co., Ltd., Britannia Works, Engine Street, Smethwick, Birmingham. A meeting of creditors will be held on June 22nd at Queen's Hotel, Birmingham.

Swiss Loan for Bavarian Works.—The *Financial News* reports that the Lech Electrical Works of Augsburg, Bavaria, has placed in Switzerland through a financial group headed by the Bank for Electrical Enterprises, Zurich, a loan of 12,000,000 Swiss francs. The loan bears interest at 7 per cent., and is redeemable within twenty-five years. For the present there will be no public issue.

Lighting and Power Notes.

Adwick-le-Street.—SUPPLY DURING THE STRIKE.—The Urban District Council has rejected the request of over 150 householders at Skelton, near Doncaster, that their supply of electricity should be discontinued during the coal stoppage. The houses occupied by the applicants are supplied with unlimited energy at a weekly charge of not more than 1s. 7½d. per week. The chairman of the Electricity Committee said that applicants were acting within their rights under a clause which said that if a consumer wished to cease taking a supply 24 hours' notice must be given. The Clerk agreed that in law the applications might be in order, but he did not advise that the request be granted. It was pointed out that if permission were given it would be followed by applications during the summer for supply to be discontinued, followed in the winter by requests for renewal.

Australia.—TUMUT.—The *Sydney Morning Herald* reports that the Minister for Works has informed a deputation from the Tumut Municipal Council and the Gadera Shire Council that within a few years the waters of the Tumut Valley would be required as part of the Burrinjuck hydro-electric scheme. Preliminary steps have already been taken for the establishment of a power-house on the Gilmore Creek, near Tumut, to link up with Burrinjuck. The Minister has been informed that a Melbourne company is prepared to spend £1,000,000, and also to supply electricity at a ½d. per kWh.

CASINO.—The new power station at Casino was officially inaugurated in May by the Mayoress, Mrs. Elesmer Jones.

Bangor.—APPLICATION FOR LOAN.—Application is being made by the Corporation to borrow the sums of £3,000 for expenditure on mains and services and £800 for meters.

Barnstaple.—LOAN.—The Town Council has applied for sanction to borrow £3,500 for prospective capital expenditure in connection with the electricity undertaking during the next twelve months.

Bedwellty.—APPLICATION FOR LOAN.—The Urban Council has applied for a loan of £7,945 for electricity purposes.

Billericay.—INSTITUTION LIGHTING.—The Board of Guardians has applied to the Ministry of Health for sanction to a loan of £4,259 for the installation of electric lighting at the new hospital and the institution.

Blackburn.—BULK SUPPLY.—The Mid-Lancashire Electricity Board has made an effort to effect an extension of the existing bulk supply agreement between the Blackburn and Darwen Corporations, but without success.

Bradford.—LOAN.—The Electricity Committee has asked the City Council to approve an application for sanction to borrow £150,000 to meet estimated expenditure on mains and services during the next three years.

STREET LIGHTING.—A special sub-committee appointed some time ago to review the street lighting situation has received a report from Mr. J. F. Colquhoun, street lighting engineer of Sheffield, and vice-president of the Institution of Public Lighting Engineers, who was called in as consultant to examine the street lighting system and give advice on methods of improvement. A feature of the report is a recommendation that gas lighting be replaced by electricity on the main tramway routes. It is recommended that a street lighting engineer be appointed and that the remaining gas lighting be automatic. The sub-committee has accepted the recommendation that a street lighting engineer be appointed, and offers £500 per annum.

Burton-on-Trent.—YEAR'S WORKING.—We have received from Mr. T. Hall, borough electrical engineer, a copy of his report together with the statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £94,937, as compared with £87,559 in the preceding year. Working expenses were £46,498, as against £46,502, leaving a gross profit of £48,440 (£41,058), to which was added a sum of £229 from house rentals, making a total of £48,669 available. After providing for capital charges there was a net surplus of £15,153, of which £2,000 was contributed to the borough fund and the remainder transferred to renewals fund. Reductions in the charges equivalent to a revenue of £5,000 were made during the year. The sales of electrical energy amounted to 15,628,445 kWh, an increase of 2,136,648, and the average price obtained fell from 1.51d. to 1.42d. The maximum supply demanded rose from 4,450 to 5,500 kW. During the year the districts of Swadlincote and Overseal were added to the distribution system.

Cheltenham.—OIL FUEL.—The Electricity Committee has authorised the borough electrical engineer to purchase 50 tons of fuel oil and to make any necessary alterations to the boilers for using the fuel with a view to maintaining as full a supply to consumers as possible during the coal dispute.

Chesterfield.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction for a loan of £5,50 0for the provision of rotary converter plant.

Colombia.—CARTAGENA.—The electricity undertaking recently erected at Cartagena has successfully passed the boiler and turbine tests, and is to be taken over by the municipality of Cartagena.

Continental.—FRANCE.—The Paris correspondent of *The Times* reports that a new hydro-electric power station was inaugurated on June 5th at Eguzon, on the Creuse, in the Department of Indre, some 200 miles from Paris. Here the river has been dammed with a barrage of reinforced concrete, 200 ft. high, and a lake formed containing 72,000,000 cu. yd. of water. The water, passing through pipes 13 ft. 9 in. in diameter, drives five turbines each of 10,000 kW. The 10,000-V energy is transformed up to 90,000 and 150,000 V and is conveyed towards Paris by two lines with numerous sub-stations at intervals, at which the voltage is reduced to 1,500 for traction on the Orleans Railway. It is hoped to save 250,000 tons of coal a year. During slack hours on the railway there will be 20,000 to 30,000 kW surplus available for Paris.

A new 10,000-kW steam turbo-generator has recently been added to the power station at the collieries of the Compagnie des Mines d'Anzin in Northern France.

BULGARIA.—Work has recently commenced on the establishment of a new central power station in Sofia by the Compagnie d'Electricité de Sofia et Bulgarie. Since 1915 the number of consumers has increased from 7,900 to 23,400, and last year the company supplied 14,605,600 kWh, as against 12,637,100 kWh in 1924. A 35,000-V transmission line is being erected between Sofia and Kourilo, a distance of about eight miles.

SWITZERLAND.—Some further particulars of the new Ryburg-Schworstadt super power station which is to be established on

the Rhine as a joint enterprise of the Baden (Germany) Provincial Electric Supply Co., and the North East Swiss Electric Power Co., were given at the recent annual meeting of the Rheinfelden Electric Power Transmission Co. The new plant is to have an eventual capacity of 110,000 h.p., the cost of construction being estimated at £2,400,000.

The Lac de Joux Electric Power Co. has decided on the establishment of a large new power station at an estimated cost of £200,000 with the objects of meeting the increasing demand in the district and also to "export" electricity to France.

CZECHO-SLOVAKIA.—The South Slovakian Electricity Co., of Komarno, which is to supply electricity to a large area in the south of Slovakia, has been formed with a capital of 8,000,000 crowns. Of this the Czecho-Slovakian Government has subscribed 3 million crowns while the remainder has been taken up by the local authorities in the districts to be served by the company. The State is erecting the main power station at its own expense, and will lease to the company for a period of 30 years.

Darlington.—INQUIRY.—An inquiry was held on June 8th by Col. E. T. C. Ekin, Inspector for the Electricity Commissioners, into an application by the Corporation to extend its area of electricity supply so as to include parts of the rural districts of Croft and Darlington. For the Corporation it was stated that it was intended to supply a ring of parishes immediately adjoining the borough boundary which were close to the electricity works. The Corporation was prepared to lay mains in roads and villages where the demand for a supply was satisfactory. The scheme was opposed by the Rural Councils concerned, who demanded that compulsory mains should be laid in certain villages covered by the Corporation's application. The Commissioners' decision will be given in due course.

Darwen.—APPLICATION REFUSED.—An application by the Darwen Corporation for permission to extend its electricity plant by the installation of a 2,000-kW turbo-alternator and one Lancashire boiler has not been granted.

REDUCTION OF CHARGES.—The reduction of the charges for electricity by the Darwen Town Council amount to a total of over £2,800 per annum.

Dover.—YEAR'S WORKING.—The financial statement of the working of the Electricity Department (engineer: Mr. R. C. Harpur) for the year ended March 31st, 1926, records a total income of £55,817, as compared with £52,229 for the previous year. The working expenses amounted to £25,964, as against £28,526, leaving a gross profit of £29,853 (£28,526). The reduction of capital costs, &c., leaves a net balance of £9,253, as compared with £2,023 for 1924-25. The capital expenditure during the year amounted to £14,123, bringing the total up to £296,445. The total kWh sold during the year was 3,070,884, a decrease of 5.04 per cent. on the number for the previous year. The average price per unit amounted to 4.36d.

Gravesend.—ELECTRICITY SUPPLY.—The Electricity Committee has passed estimates of £2,300 for rectifier equipment at Old Road sub-station and £2,000 for h.p. mains to the station from the electricity works.

The Electrical Engineer reports that the cost of providing a supply of electricity to the Tollgate will be approximately £3,000.

Great Yarmouth.—ELECTRICITY IN BULK.—The Electricity Committee is to submit to Lowestoft Corporation terms upon which it would be willing to give a bulk supply of electricity, and a sub-committee has been appointed to confer with the Corporation on the subject.

Hastings.—EXTENSION OF SUPPLY.—The Town Council has decided to extend the mains for the supply of electricity to the housing estate at Broomgrove and for public lighting at an estimated cost of £2,390.

Hazelgrove and Bramhall.—LOAN.—The Urban District Council has applied for sanction to a loan of £1,500 for meters.

Heckmondwike.—SUPPLY RATIONING.—The District Council is rationing its electricity supply to industries, preference being given to food supplies and essential services.

Ilford.—LOAN.—The Urban District Council has applied for sanction to a loan of £5,820 for electricity purposes.

Loughborough.—EXTENSION OF SUPPLY.—A scheme for the extension of its electricity supply to the Nanpantan suburb has been adopted by the Town Council, and application is to be ade for sanction to borrow £3,850. An 11,000-V cable is to be laid partly underground and partly overhead, and a sub-station provided with a 100-kW transformer.

Luton.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to the borrowing of £5,000 for meters and overhead mains.

Middleton.—NEW PLANT.—The Town Council has decided to purchase a 1,000-kW converter for £4,360, and has authorised application for sanction to borrow £5,860 for equipment, &c.

Northern Ireland.—BELFAST.—The Corporation has decided to apply to the Electricity Commissioners for Northern Ireland for sanction to a loan of £110,500 for electricity supply extensions

Plymouth.—PLANT EXTENSIONS.—The Electricity Committee of the Corporation has placed an order for a 7,500-kW generating set, the cost, with auxiliaries, being £35,000. The set is to be installed at the Prince Rock station.

Shelf.—BULK SUPPLY.—It is reported that the electricity supply from the Electrical Distribution of Yorkshire, Ltd., is to be available by the end of June.

Shrewsbury.—LOANS.—The Electricity Committee has decided to apply for sanction to the borrowing of £7,000 for mains and £3,000 for services.

Spalding.—UNDERGROUND CABLE.—The Council is to lay underground cables in preference to erecting overhead transmission lines for the supply of electricity in bulk from the Peterborough Corporation, which is expected to be available next March. Tenders for the supply of cable are to be invited.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Electrical Distribution of Yorkshire, Ltd., to supply electricity in the urban districts of Denby, Denby and Cumberworth, Dodworth, Gunthwaite and Ingbirchworth, Hoylandswaine, Shelley, Shepley, Stocksbridge, Thurlstone, Baildon, Denholme, Queensbury, Shelf, and Southowram, and parts of the rural districts of Barnsley, Penistone, and Wharfedale; and Messrs. Crompton & Co., to supply in the urban districts of Seaford and Newhaven, and part of rural district of Newhaven.

Application has been made to the Commissioners by the Urban District Council of Barnoldswick for a Special Order authorising it to supply electricity in the urban district.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical World* the Federal Power Company of Knoxville, Tenn., has applied to the Federal Power Commission for a preliminary permit covering a proposed development on the Nolichucky-Toe Rivers near the North Carolina and Tennessee lines. The primary power to be made available is estimated at 27,800 h.p. The applicant proposes, however, to install 72,000 h.p. The power is intended for public utility service and for use by the electrochemical industry.

The Pacific Gas and Electric Company has in hand a scheme for supplementing the output of its Electra plant. It is proposed to construct a reservoir at Salt Springs, in the Sierra Nevada Mountains, 3,800 ft. above the sea level. The water will be conveyed 23 miles by canal and tunnel to Tiger Creek, where it will fall 1,200 ft. to a new power house of 47,000-h.p. capacity. After passing through the generators of Tiger Creek power house the water will be carried on to the 27,000-h.p. Electra plant, which has lacked sufficient water supply to operate at full capacity in the summer months. The new development will cost about $10,000,000.

Wimbledon.—YEAR'S WORKING.—We have received from the engineer and manager of the Electricity Department (Mr. A. E. McKenzie) a copy of the report of the working of the undertaking for the year ended March 31st last. The total revenue for the year amounted to £130,987, as compared with £116,147 for the previous year. The generating costs for the period in question amounted to £33,696, against £34,460. The net profit of the concern for the year was £33,505 (£23,971). During the year the maximum load on the station increased from 5,280 kW to 6,300 kW. The units sold amounted to 13,586,008, of which 4,520,588 were used for heating and cooking. The average price per kWh was 2.18d., compared with 2.38d. for the year 1924-25. The works costs per unit sold were 21.35 per cent., the total inclusive costs 14.66 per cent., and the coal consumption per kWh was 14.2 per cent. lower than in the previous year. Twenty-eight miles of cable was added to the distribution system during the year.

Tramway and Railway Notes.

Australia.—RAILWAY ELECTRIFICATION.—The South Australian Premier announced recently that the Government has decided on the electrification of the Glenelg railway, which will be the first undertaking of its kind in the State. The Municipal Tramways Trust will supply the electricity and it is expected that the work will be completed in eighteen months. The Premier said that after investigations extending over three years, it had been decided that the most economical method of operating the North and South Terrace lines between Adelaide and Glenelg was by electric traction.—*Reuter's Trade Service* (Melbourne).

Bradford.—THROUGH-RUNNING TICKETS.—The Tramways Committees of the two Corporations are negotiating with a view to issuing through tickets on the Bradford Corporation tramways and the Keighley Corporation motor-'buses, the connection of the two systems being at Cross Flatts.

LOAN SANCTIONED.—The Tramways Committee has received sanction to a loan of £48,000 for track renewals.

Continental.—ITALY.—The tramways between Mantova and Asola and between Mantova and Viadana are to be electrified.

HOLLAND.—A change from a.c. to d.c. has recently been made on the electric railway between Rotterdam and The Hague. The Rotterdam-Scheveningen trains running partly over the same lines are still steam-operated, but it is expected that the line will shortly be completely electrified. Good progress is

also being made with the electrification of the main line between Amsterdam, Haarlem and Rotterdam, and work is expected to be completed next year.

SWITZERLAND.—The report of the working of the Swiss Federal railways during 1925 shows that the output of the Amsteg-Ritom power station last year amounted to 143 million kWh, of which 139 millions were utilised for train haulage purposes. The output shows an increase of about 30 million kWh over 1924, this being due to the completion of the electrification work on the Zurich-Olten, Zurich-Winterthur and Olten-Berne sections. The output of the Barberine power station advanced from 9 million to 23 million kWh, the increase in this case being due to the completion of the electrification work on the Lausanne-Yverdon, Daillens-Le Day and Renens-Geneva sections.

DENMARK.—What is stated to be the first railless electric trolley motor-'bus service in Denmark is shortly to be started in Copenhagen. It is stated that the order for the chassis of the vehicles has been placed in England, while the bodies are to be built in Denmark.

Dewsbury.—COAL CONSERVATION.—With a view to preserving its coal stocks, the Corporation has reduced its tramway services by about 25 per cent.

Leeds.—OIL FUEL.—To help in conserving the decreasing coal supply some of the boilers at the tramway power station at Crown Point are now being partly fired by oil fuel. If and when all the coal reserves are exhausted the boilers can be fed entirely by oil. The plant installed for this purpose during the last mining crisis has been left intact for a repetition of such an emergency.

Liverpool —RESTRICTED AND RESTORED SERVICES.—Following a restricted supply of electricity for power and tramways during the previous few days, the Liverpool Tramway and Electric Power and Lighting Committee on June 4th authorised a full supply of electrical energy for power purposes and a normal tramway service.

London.—MORDEN LINE COMPLETED.—According to *The Times*, the new tube railway from Clapham Common to Morden, which has been constructed at a cost of nearly £3,000,000, has been completed, and it is expected that it will be opened next month. The new railway, which is an extension of the underground system, will serve a population of about 300,000 people. All that is now required is the completion of the electrical equipment and signals. The stations have all been constructed, and the rolling stock has been delivered. Of the five miles of track between Clapham Common and Morden, the first 4½ miles are underground. The remaining half-mile, from Dorset Road to Morden, has been constructed on the "cut and cover" principle, and the railway runs into the open at Morden Station

TRAIN INDICATORS.—Train destination indicators which automatically show passengers the destination of the next train and of the two succeeding trains are to be introduced on the tube lines. These indicators are now being installed on the platforms at Leicester Square, Tottenham Court Road, Charing Cross, Kennington, Euston, Bank, Moorgate, Waterloo and Morden stations, and will be available for use in about a month's time.

Persia.—TEHERAN.—*Commerce Reports* states that the electrification of the horse-tramway system of Teheran has been proposed, and pressure is being brought by the Government upon the Belgian company holding the concession. The company has advised the Government of its willingness to make the change, but suggests that the cost would be prohibitive unless permission to transport materials through Russian territory is secured by the Persian Government.

Sheffield.—TRAMWAY EXTENSION.—The Tramway Committee has prepared a scheme for the extension of the tramway from Millhouses to Beauchief at a cost of £99,000.

Sunderland.—YEAR'S WORKING.—We have received from Mr. A. R. Dayson, manager and engineer of the Tramways Department, a copy of the annual report for the year ended March 31st, 1926. The total income for the year is shown as £124,416 and the working expenses as £99,202, leaving a gross balance of £25,214. After the payment of capital charges, &c., a net balance of £14,068 is left. The car miles run amounted to 1,652,221, the passengers carried to 29,792,834, and the number of units used per car mile was 1.3. During the year £20,346 was spent from the capital account, bringing the total capital expenditure up to £365,750.

TRACK EXTENSION.—The Town Council has decided that the single line of tramway track near the Grangetown terminus shall be doubled, at an estimated cost of £7,000.

Walsall.—YEAR'S WORKING.—The statement of accounts for the tramway undertaking (manager and engineer: Mr. W. Vane Morland) for the year ended March 31st last records a total income of £135,698, of which £80,407 was received from the tramway services and £55,291 from the motor services. The total working expenses amounted to £119,374; tramway, £72,057; and motor, £47,317, leaving a net revenue of £16,324 (£8,350 and £7,974). A total of £6,000 is being given to the relief of rates. The net car mileage on the tramway system amounted to 1,011,544, the passengers carried being 11,800,137. The energy consumption per car mile amounted to 1.471 kWh.

St. Helens.—TRACK RENEWALS.—The borough engineer has submitted to the Tramway Committee a scheme for relaying the tramway track in Corporation Street, Cotham Street, and Shaw Street, and laying track in Station Road and Ormskirk Street, at a total estimated cost of £14,900.

Telegraph and Telephone Notes.

Anglo-Norwegian Cables.—AGREEMENT TERMINATED.—In 1911 the British and Norwegian Governments jointly acquired the Great Northern Telegraph Co.'s cable between Scotland and Norway, but by arrangement with the Post Office the working in Great Britain both of this and of a duplicate cable laid by the two Governments remained in the hands of the Company. The remuneration received for the working of these cables has gradually become insufficient, and the Company has therefore been compelled to terminate the arrangement as from the middle of May last, when the General Post Office itself took over the working of the cables.

The recently-issued report of the Great Northern Telegraph Co., Ltd., for 1925 shows that about 4,968 nautical miles of cable are now being operated in Europe and approximately 3,453 miles in the Far East. By strengthening and renewing all weak sections, the Company's cables have been maintained in excellent condition, the number of breaks repaired during 1925 showing no increase as compared with previous years. In Europe 26 breaks were repaired in 10 cables, and in the Far East 22 breaks in eight cables, apart from which six shore ends were renewed in the Far East.

Brazil.—NEW RADIO STATION.—The new high-power wireless-telegraph station at Rio de Janeiro, which was opened recently by the Brazilian Minister of Communications, has been equipped with a 20,000-metre-ampere valve transmitter by Marconi's Wireless Telegraph Co. The station is being used for telegraph communication by radio between Brazil and Europe, Africa, Australia, North America, and the other countries of South America.

Germany.—WIRELESS ON RHINE STEAMERS.—Permission has now been accorded by the Inter-Allied Rhineland High Commission for the use of wireless transmitters and receivers on Rhine steamers when passing through "occupied territory." Certain conditions are attached to the permission: The maximum wave-length permitted is 600 metres, and the capacity of transmitters may not exceed 250 watts; all apparatus must be registered with the Post Office and an accurate description deposited with the authorities.—*Reuter* (Cologne).

India.—AUTOMATIC TELEPHONY.—Our special correspondent reports that, owing to a number of disadvantages now disclosed in the working of the automatic telephone system, the Government of India has abandoned its intention of extending the system to places where it has still to be introduced. The principal defect found is that the system requires intelligent operation and mishandling is likely to result in wrong numbers being obtained, the subscriber having to pay for his mistake. On this account the system is not considered to be quite suited to India. Wherever automatic instruments have been introduced, they have become unpopular. Even the economy vouched for when the system was being introduced has not materialised, because, though it was expected that by reason of the reduction in the number of operators, money would be saved, it has been found necessary to employ expert and highly-paid supervisors to attend the more complicated adjustments inseparable from the automatic system. The care needed to "dial" a number often proves too exacting for the average user in India.

The Telephone Service.—LAST MAGNETO EXCHANGE.—The "Bank" telephone exchange rang its own death knell on June 5th. It was the first London exchange to be fitted with a multiple switchboard, and the last to be worked on the "magneto" principle, which obsolete method of calling the attention of the operator by turning a handle and ringing a bell has now passed for ever. In point of numbers, "Bank" was the smallest of the London exchanges, having less than 1,000 subscribers, who will now be transferred to the "Central" exchange.

Telegraph Regenerator.—NEW CABLE DEVICE.—Sir John Denison-Pender, in his speech to the shareholders of the Eastern Telegraph Co., mentioned that during the past year an invention of the staff of considerable importance had been installed upon certain of the Company's cables, and would be on practically all its cables so soon as the necessary apparatus could be made. It was termed a "regenerator," and overcame the disabilities inherent in the old system of relaying from one cable into another cable, which did not permit of successful operation of a chain of cables, except at greatly reduced speeds, owing to distortion of signals both in the cables and in the relay apparatus, which distortion became cumulative. The regenerator, which had been installed on the London-Porthcurnow-Carcavellos-Gibraltar cables for over eight months, had increased the speed by over 35 per cent. The additional gain in traffic-carrying capacity due to reduction of stoppages and improved working amounted to 13 per cent., making the total gain on this section over 48 per cent. It had also just been installed on the Gibraltar-Malta-Alexandria station 3 section with improved carrying capacity of 27 per cent. Efforts were continuously being made on other circuits to increase speeds, and, as an instance of the results achieved, the present speed in and out of London on the Company's cables was 23 per cent. in excess of that existing in 1922.

Radio Notes.

Australia.—WIRELESS CONFERENCE.—At inter-State conference was held recently at Sydney, at which animated debates took place on the subject of licence fees and the future control of wireless in Australia. After a prolonged discussion it was recommended that the Federal Ministry should be asked to appoint an advisory board to assist in the administration of broadcasting regulations. Spirited discussion followed a proposal that a Royal Commission be appointed by the Government to consider the advisability of confining the commercial broadcast wave-length in Australia within the standard length of from 200 to 600 metres, but it was eventually decided to take no action with regard to wave-lengths. The conference decided to ask the Federal Postmaster-General to increase generally the margin of wave-length between the stations 4QG (Queensland), 2BL (New South Wales), 3LO (Victoria), 3AR (Victoria), and 5CL (South Australia).—*Reuter's Trade Service* (Melbourne).

Licences.—STILL INCREASING.—Answering a question in the House of Commons, the Postmaster-General (Sir W. Mitchell-Thomson) said the total number of wireless licences at present in force in Great Britain and Northern Ireland was about 2,050,000.

New High-power Station.—DAVENTRY TESTING PLANT.—A new high-power broadcasting station is in course of construction at Daventry for the purpose of experimenting in the direction of making alternative programmes available to a wide circle of listeners provided only with simple receiving sets. The object of the British Broadcasting Co. is to see how far it is possible to provide such programmes without interfering with the existing services of the Government, the Army, the Navy, and the Air Force. The experiments will probably be carried out in the early hours of the morning, and no public programme will be issued from the new station. The strength of the station is to be from 10 to 15 kilowatts, and it is not to be an addition to the present series of stations, but simply for experiments on the ordinary broadcast wave band.

Venezuela.—BROADCASTING SITUATION.—The Empresa Venezolana de Radiotelefonia was formed towards the latter part of 1925 for the purpose of broadcasting entertainments, news, lectures, &c., and to import, construct, sell, rent, and maintain all classes of broadcast radio receivers. The broadcasting station is provided with a 1-kW transmitter, and an aerial supported on two 165-ft. lattice-steel towers, all of American manufacture, the installation and testing having been successfully concluded in May, 1926. H.M. Consul at Caracas reports to the Department of Overseas Trade that the wave-length at present in use is 375 metres; public supply of electricity is relied upon for power, but, in spite of the use of an automatic regulator, trouble is being felt, due to the erratic nature of this power supply. It seems unlikely, however, that local broadcasting will be taken seriously, and consequently purchasers of receiving apparatus will probably still depend essentially on foreign stations for their entertainment.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Asia Minor.—BAGDAD.—June 28th. Direction Générale des Chemins de fer d'Anatolie. One electrically-driven semi-portal crane. (A.X. 3191.)*

Australia.—MELBOURNE.—June 28th. Electricity Commission of Victoria. 22,000-V transformers and spares. (B.X. 2528.)*

August 23rd. 10-in. disk suspension insulators. (B.X. 2614.)*

July 14th. Victorian Government Railways. A.c. power interlocking machine. (B.X. 2596.)*

September 1st Automatic sub-station equipment for Elwood sub-station. (B.X. 2598.)*

August 11th. City Council. H. and l.p., 3-phase sub-station switchgear.*

August 3rd. Postmaster-General's Department. Telephones and dials.*

August 10th. Telephone exchange indicators. (B.X. 2597.)*

BRISBANE.—August 26th. City Electric Light Co., Ltd. One 12,500-kW turbo-alternator.*

Belfast.—June 29. Harbour Commissioners. Two electrically-driven main pumps, &c. Specification, &c., from the Harbour Engineer, Harbour Office, Belfast.

Belgium.—June 30. Belgian Post and Telegraph authorities, La Salle Madeleine, Brussels. 240 kilometres of bronze wire in six lots. Particulars (Cahier des Charges Special No. 3-196) for 95 centimes.

Bentley-with-Arksey (near Doncaster). — June 22nd. Urban District Council. Tubing, wiring and electrical fitting of 32 houses and 16 bungalows on Jossey Lane housing site. Mr. P. C. Woodhall, engineer, Council Offices, Bentley.

Brazil.—PORTO ALEGRO.—July 8th. Municipal Council. Electrical material for street lighting. (B.X. 2571.)*

Burnley.—June 26th. Joint Hospital Board. Electric lighting system at the Sanatorium, Marsden Road. (June 4th.)

Dublin.—June 23rd. Great Southern Railways, Ireland. One steam crane and lifting magnet. Forms of tender from the Stores Superintendent, Inchicore, Dublin.

June 24th. County Borough Commissioners. Arc lamp carbons, electric cookers, and h.p. and l.p. circuit breakers. (June 11th.)

June 28th. One steam turbo boiler feed pump, three air filters, two electric vehicles, and steam and water meters. (June 11th.)

Egypt.—CAIRO.—June 30th. Ministry of the Interior. One Diesel engine, direct coupled to an 80-kW generator, complete with switchboard. (B.X. 2537.)*

October 15th. Installation of electric power station equipment at Kench and Luxor. (B.X. 2627.)*

July 10th. Director-General, State Domains Administration (Commercial Service), Savoy House, Qasr el Nil Street, Cairo. Three semi-Diesel engines and two centrifugal pumps.

August 2nd. Director-General, Mechanical Department, P.W.M., Cairo. 400-b.h.p. Diesel engine, driving an air compressor, together with auxiliary machinery.

Glasgow.—June 21st. Education Authority. Installation of electric light at Provanside School. Mr. J. Clark, Director of Education, 129, Bath Street.

Grays.—June 30th. Grays Thurrock Urban District Council. H.p. switchgear, 3,300-V, 3-core cable, and transformers. (See this issue.)

Hamilton.—Lanarkshire County Council. Electric lighting installation at school, Hairmyres Colony. Mr. P. C. Smith, Housing and Town Planning Department, Hamilton.

India.—July 2nd. India Store Department. E.h.p. armour-clad switchgear. (June 11th.)

London.—BERMONDSEY.—July 15th. Borough Council. Electrical installation for lighting, heating, and power at the baths and washhouses, Grange Road. (June 11th.)

Lurgan.—June 21st. Urban District Council. Oil engines and generators, motor-driven pumps, main switchboard, and underground and overhead mains. (June 4th.)

Manchester.—July 7th. Electricity Department. Two 130,000-lb. water-tube boilers, flues, coal chutes, ash hoppers, pipework, valves, induced- and forced-draught plant and chimneys, one 40,000-kW turbo-alternator, with condensing plant, &c. (June 4th.)

July 5th. 33,000-V trunk feeders, pilot cables, and telephone cables. (June 11th.)

New Zealand.—CHRISTCHURCH.—October 19th Christchurch Drainage Board. Three sets of electric centrifugal pumping plant. (A.X. 3215.)*

WELLINGTON.—August 24th. Public Works Department. Synchronous condensers for the Waikaremoana Electric Power Scheme. (B.X. 2608.)*

July 20th. Phase transformer for Mangahao electric power scheme.*

August 30th. 400-V, 3-phase, slip-ring induction motors and starters.*

November 2nd. Electric generators and turbines for Waikaremoana electric power scheme. (B.X. 2622.)*

Normanton.—July 5th. Urban District Council. 1,400 yd. feeder cable. (See this issue.)

Nottingham.—July 6th. Electricity Department. Twelve months' supply of general stores. (See this issue.)

Otley.—June 21st. U.D.C. Electricians' work in connection with the erection of 56 houses, Harefield estate, Farnley Lane. Surveyor to the Urban District Council.

Salford.—June 26th. Electricity Department. Complete workshop equipment for the Agecroft power station. Specifications from the City Electrical Engineer.

South Africa.—July 8th. South African Railways and Harbours. Telegraph material, poles, cross arms, &c. (A.X. 3173.)*

Uruguay.—MONTEVIDEO.—July 6th. State Electricity Works. 1,000,000 metres of insulated conductors. (B.X. 2523.)*

July 9th. 137,500 metres of rubber-insulated wires and cables. (B.X. 2548.)*

40,000 metres of coloured twin conductor cords. (B.X. 2549.)*

July 22nd. 35,000 electric lamps.*

Wolverhampton.—July 10th. West Midlands Joint Electricity Authority. Two turbo-alternators, condensing plant, &c., for Birchills power station. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—SYDNEY.—City Council.—The Council at its meeting on May 3rd, decided to postpone consideration of the Electricity Committee's recommendation to accept the Australian Commonwealth Shipping Board's tender for mechanical draught plant at £98,833, pending receipt of cable advice from Mr. Forbes Mackay, who is to compare the tenders lodged, &c., and report.—*Tenders.*

The following tenders were accepted :—

Switchgear for Bunnerong power house (£181,356).—Metropolitan-Vickers Electrical Co., Ltd.

Underground cables (section 1).—W. T. Henley's Telegraph Works Co., Ltd. (£4,634); (sections 2, 3, 4, and 5), Enfield Cable Works (Aust.), Ltd. (£19,244).

Fuse boxes and fuses (£10,094).—B. W. Electric Co., Ltd.

H.p. jointing material (£9,762).—Noyes Bros. (Sydney), Ltd.

L.p. d.c. machine panels (£1,300).—Metropolitan-Vickers Electrical Co., Ltd.

NEW SOUTH WALES RAILWAYS. Accepted :—

100 B.T.-H.-type traction motors (£21,936).—Australian General Electric Co., Ltd.

MELBOURNE.—Commonwealth Department of Works and Railways.

Two main passenger electric elevators, Sydney G.P.O. (£9,560).—Standard-Waygood, Ltd.

Electric elevator (kitchen), Sydney G.P.O. (£1,850).—Edmiston & O'Neill Pty., Ltd.

State Electricity Commission of Victoria.

Aluminium cable (£3,943).—British Insulated Cables, Ltd.

—*Tenders.*

Chesterfield.—Electricity Committee. Accepted:—

Cable (£213).—W. T. Glover & Co., Ltd.

Glasgow.—Electricity Committee. Accepted:—

Twelve months' supply of :—

Malleable iron tubes and fittings.—Stewarts & Lloyds, Ltd.

L.p. cables.—Callender's Cable & Construction Co., Ltd.; Enfield Cable Works, Ltd.

H.p. cables.—Callender's Cable & Construction Co., Ltd.; W. T. Glover and Co., Ltd.

I.r. cables and flexibles.—Craigpark Electric Cable Co., Ltd.

Meters.—Chamberlain & Hookham, Ltd.; Edison Swan Electric Co., Ltd.; Elkay Electrical Mfg. Co., Ltd.; Ferranti, Ltd.; Measurement, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.

Arc lamp carbons.—General Electric Co., Ltd.

Cast-iron boxes, section pillars, &c.—Carron Co.; Falkirk Iron Co., Ltd.; M'Dowall, Steven & Co., Ltd.; Robert Taylor.

Cotton waste and dusters.—Easson Bros.; Joseph Findlay & Co.; Porter Bros., Ltd.; Tindal, Hamilton & Co.; Wm. Wiseman & Sons.

Health Committee. Accepted :—

Electric lighting installation at York Street reception house (£87).—Northern Electric Co.

Tramways Committee. Accepted :—

D.c.c. wire.—R. Johnson & Nephew; Siemens Bros. & Co., Ltd.

India.—BOMBAY.—Municipal Corporation. Accepted :—

Electrical installation at students' hostel :—

Marsland, Price & Co., Ltd. (Accepted.)	Rs. **6,490**
Eastern Electric Light and Power Co.	6,889
Holland & Co.	8,593
Crompton & Co., Ltd.	8,792
Sterling Electric Works, Ltd.	8,900
Josts Engineering & Co., Ltd.	8,969
Greaves, Cotton & Co., Ltd.	10,000
Allen Electric Co.	11,016

Lamp Contracts.—Contracts for "Cosmos" electric lamps have been placed with Metro-Vick Supplies, Ltd., by the London, Midland & Scottish Railway Stores Department, the Air Ministry, and the London County Council.

London.—ADMIRALTY.

Lampholders and insulators.—Edison Swan Electric Co., Ltd.

ST. PANCRAS.—Special (Emergency) Committee. Accepted :

7,040 yd. l.p. cable (£904).—Standard Telephones & Cables, Ltd.

ST. MARYLEBONE.—Electricity Supply Committee. Recommended :—

Wiring for electricity the tenements in Ashland House (Ashland Place) and Berkeley Buildings.—London & South Wales Electrical Engineers, Ltd.

SHOREDITCH.—Lighting Committee. Recommended :—

Wiring and fittings for electric lighting, heating and cooking, tenements (50), at Archer House Extension and Arrow House (£683).—Electrical Installations, Ltd.

High-pressure boiler feed mains at the Whiston Street power station (£548).—Babcock & Wilcox, Ltd.

Newport (Mon.).—Electricity Committee. Accepted:—

Overhead line to Llanwern (£636).—Johnson & Phillips, Ltd.

Normanton.—District Council. Accepted:—

Transformers (£215).—Bruce Peebles & Co., Ltd.

Cables (£836).—British Insulated Cable Co.

L.p. switchgear (£400).—Metropolitan-Vickers Electrical Co., Ltd.

Oldham.—Electricity Committee. Accepted:—

A.c. meters.—Measurement, Ltd.

Electric motors.—English Electric Co., Ltd.

Portable conveyor.—C. H. Johnson & Sons, Ltd.

Manhole frames and covers.—John Hall & Sons, Ltd.

Meter boards.—Samuel Ashton, Ltd.

Portsmouth.—Electricity Committee. Recommended:—

Cable (£1,351).—Johnson & Phillips, Ltd.

Circulating pump (£740).—G. & J. Weir.

Steam pump (£350), electric pump (£288).—Mather & Platt, Ltd.

Sunderland.—Corporation. Accepted:—

Replacements to mechanical stokers.—Edward Bennis & Co., Ltd.

Sutton Coldfield.—Electricity Committee. Accepted:—

Switchgear (£178).—G. Ellison.

Wakefield.—West Riding County Council. Accepted:—

Goods lift for New Central Stores.—Medway's Safety Lift Co., Ltd.

Forthcoming Events.

Institution of Heating and Ventilating Engineers.—Monday, June 21st, to Wednesday, June 23rd. At Scarborough. Summer meeting.

Radio Society of Great Britain.—Wednesday, June 23rd. At the Institution of Electrical Engineers, Savoy Place, W.C. At 6 p.m. Ordinary meeting.

Institution of Electrical Engineers.—Jubilee of the Telephone. Thursday, June 24th. At the Hotel Cecil. At 1 p.m. Reception and luncheon.

At 3.30 p.m. At the Institution, Savoy Place. Lecture on the "History and Development of the Telephone," by Sir Oliver Lodge, F.R.S.

Thursday, June 24th. At the Science Museum, South Kensington. At 8.30 p.m. Annual conversazione.

Electrical Contractors' Association Allied Associations.—First Annual Conference. June 23rd, 24th, and 25th. At the Royal Pavilion, Brighton.

Tramways and Light Railways Association.—June 24th and 25th. At Torquay. Annual Conference.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

HERCULITE metal filament lamps.

Notes.

Battery Locomotive Competition.—The Secretary for Mines announces that the report of the judges appointed to adjudicate on the electric storage-battery locomotive competition for a prize of £1,000 offered by Mr. Charles Markham has been published. The object of the competition was to encourage the production of a safe and efficient type of battery locomotive for use underground in coal mines, with a view to obviating the use of pit ponies and increasing coal production. Ten entries were received, five of which were selected by the judges as being suitable for submission to working tests. The winning design was entered by Messrs. Joseph Booth & Bros., Ltd. An outline is given of the technical requirements governing the competition, the tests applied, and a general description of the winning locomotive (see ELECTRICAL REVIEW, October 2nd and 9th, 1925). The report (price 1s. 3d., by post 1s. 4d.) may be purchased through any bookseller, or directly from H.M. Stationery Office.

Threatened Tramway Strike Averted.—The Bury Council decided after the general strike to reduce the holidays of its tramway employés from eight days to four, and as a result the men threatened to refuse to run trams outside the Bury and Radcliffe area after June 19th. The Council replied that unless the men worked unconditionally according to the instructions given by the general manager their services would be dispensed with. The men have withdrawn the strike threat and the situation is to be further considered by the General Purposes Committee.

Batti-Wallahs' Trip to Paris.—The Batti-Wallahs' Society will pay a week-end visit to Paris next month, and will be happy to have the company of ladies and gentlemen introduced by members. In order that suitable hotel arrangements may be made, applications should be sent to the honorary secretary, Mr. M. Whitgift, 7, Coulter Road, Hammersmith, W.6, not later than June 22nd. The party will leave Victoria on Friday, July 24th, at 2 p.m., arriving in Paris at 8.15 p.m. It will leave Paris on the return journey on Monday at 4 p.m., arriving at Victoria at 10.15 p.m. (First-class rail, accommodation at Hotel de Louvre (or Louvois), including all meals, motor rides round Paris, to Versailles or Fontainbleau, motor on Sunday to Auteuil Races for the Grand Prix, transport of baggage, &c., £9 10s.)

Late Legal.—MARCONI VALVE PATENT.—In the Chancery Division, on Tuesday, Mr. Justice Tomlin made an order by consent granting an injunction to the Marconi Wireless Telegraph Co., Ltd., restraining Brahams (Houndsditch), Ltd., from infringing their letters patent No. 184,446 for wireless valves. Mr. Trevor Watson, for the plaintiff, said it had been agreed that defendants should pay £50 as damages and 15 guineas as fees to the plaintiff's representatives for the examination of the infringing articles.

RADIO PHONOPORE AND ELECTRICALS, LTD.—Mr. Justice Romer, in the Companies Winding-up Court, on Tuesday, made an order for the compulsory liquidation of this company, on the petition of Mr. C. W. Slingo, of 39, Loveday Road, West Ealing. Counsel for the petitioner said the petition stood over for arrangements to be made. While admitting that negotiations had not entirely broken down, it was obvious that a winding-up order could not be avoided, and he asked for the usual order.

NELSON ELECTRIC CO., LTD.—Mr. Justice Romer, in the Companies' Winding-up Court, on Tuesday, adjourned for a week the petition of Mr. Eugene Durand for an order for the compulsory liquidation of this company. Counsel for the company said the petitioner's debt had been paid, and that arrangements had been made to pay other creditors for sums amounting to £2,369 within a few days.

W. E. Highfield Shield Competition.—The deferred meeting of the London members of the National Association of Supervising Electricians was held on June 10th to decide on the winning papers in the fourth annual competition for the above shield and additional prizes. For the members' section the shield and the first prize, value £3 3s., presented by Messrs. W. T. Henley's Telegraph Works Co., Ltd., were awarded to Mr. R. K. Haslett, Belfast, for "27 Years Experience of Electrical Installation Work." The second prize, value £2 2s., presented by Messrs. Burdette & Co., Ltd., was awarded to Mr. W. J. Revell, London, for "Practical Hints on Estimating." The third prize, value £1 1s., by Millns Electrical Co., to Mr. J. Southern, London, for "Ups and Downs of Electrical Contracting." The first prize of the associates' section, value £2 2s., presented by Power Contracts, Ltd., was awarded to Mr. T. V. Harding, London, for "Marine Practice To-day," and the second prize, value £1 1s., by the Editor of *Electricity*, to Mr. H. J. Kimber, London, for "Organisation and its Relation to Progress."

Breakdown at Manchester.—It is reported that a fault on one of the 33,000-V cables connecting the Barton generating station with the city resulted in an almost complete failure of the supply to the city on June 13th.

Indian Railway Electrification.—An important contract received by the Metropolitan-Vickers Electrical Co., Ltd., from India comprises 41 electric freight locomotives for the electrification of the Great Indian Peninsula Railway main line from Bombay to Igatpuri and to Poona, both branches passing over the Ghats, where gradients of 1 in 40 and 1 in 38 are regularly encountered; the gauge of the line is 5 ft. 6 in. The locomotives will be of the side-rod type, with motors mounted above the deck, and consist of two trucks, each with three axles, coupled together with an articulating joint, a single body being mounted on the pair of trucks. Each truck will have a twin motor of 1,300 h.p. rigidly mounted on it and driving a jack shaft through single reduction gearing, with gears on each side of the motor. Pinions of the flexible spring type will be used in order to transmit the power resiliently to the jack shaft, which will transmit its power to the rear axle of the truck through long connecting rods, and to the other two axles from the rear axle by means of coupling rods. Each truck will have the same electrical equipment, the total horse-power of the locomotive being 2,600 h.p. on the one-hour rating. The motors will be provided with forced draught so as to enable a high continuous rating to be obtained. The centre of gravity of the locomotive will be comparatively high, with the main running axle boxes inside the wheels, which will give a very good combination for smooth running. The locomotive speed will generally be about 20 miles per hour on the gradient, with a maximum speed of 45 miles per hour. Regenerative braking is to be provided to enable heavy trains to be safely handled on the hilly section of the line.

Proposed Electrical Congress in Moscow.—The Trade Commissariat has authorised the State Planning Commission and the Supreme Economic Council to call a Pan-Union Electrotechnical Congress in Moscow towards the end of the year.—*Reuter's Trade Service* (Moscow).

Drying-Out Plant for Transformers.—In Bulletin No. 56/57, just issued by Messrs. Oerlikon, Ltd., London, there appears a description of a new drying-out installation recently put into service at the Oerlikon Works in Switzerland, which presents several interesting features. It consists of a tank capable of accommodating the largest transformers, in which the air is exhausted during the drying-out process by means of a vacuum pump. Heating is effected either by steam pipes arranged in the tank, or by an external heater through which the oil of the transformers is forced by a circulating pump. The tank has a diameter of about 16 ft. and a total height of about 22 ft. The tank has a circular section, both bottom and cover being dished; the cover is fitted with a vacuum gauge and a thermometer. Provision has been made for glass inspection windows and electric lighting in the tank, so that the upper surface of oil in the transformer tank can be easily examined during the drying-out process. The cover of the tank is hinged and can be raised by means of a motor-driven winch; the tank is nearly completely sunk in the floor.

The use of steam heating by means of the pipe system is mainly confined to cases where a number of small transformers are being dried out at the same time. When, however, large transformers with a great heat capacity have to be dealt with, this mode of heating is too slow, owing to the low thermal conductivity in the tank, due to the rarefaction of the air. The transformers are then dried out by causing the oil to circulate through the oil heater, which is of standard Oerlikon design and has a capacity of 100 kW. Owing to the fact that the oil is heated indirectly in this plant and does not come into contact with the electric heating coils, there is no danger of the oil being overheated at any point. The oil heater is fitted with safety devices which cut off the heating current when the temperature of the oil rises too high, or interrupts the oil circulation. Arrangements have been made to permit of heating the oil directly by means of electrical resistances, should it be desired, air-tight bushings being provided for leading in the conductors.

As the drying-out process is carried out with a high vacuum in the tank, the circulating pump for the oil heater cannot operate as a suction pump, but has to be used as a compression pump; consequently, it has been necessary to mount it at the bottom of the tank. The oil heater, however, is installed above on the floor level, at the side of the tank. The circulating pump consists of a centrifugal pump built as an integral part of the driving motor; the pump has no glands and no external moving parts; it requires no attention, works practically noiselessly, and is very reliable in operation. The vacuum pump for exhausting the air in the tank is also of the Oerlikon Co.'s manufacture.

Fatalities.—At an inquest at Boosbeck, Redcar, recently on Henry Nellist, 16, it was stated that while in some outbuildings he took hold of about three inches of non-insulated wire attached to an electric lighting ceiling fitting and received a fatal shock. A verdict of "Accidental death" was returned.

An inquiry was held recently into the death of J. E. Redwood (36), who was killed by falling a distance of 70 ft. whilst working at the Grove Road generating station, St. Marylebone. Deceased was engaged in shifting tackle. A verdict of "Accidental death" was recorded.

As the result of burns received from a fire at the Osborne Street, Manchester, generating station on June 10th, John Ryan (36) died in the Jewish Hospital on the same day.

Fulham Strike Episode.—It is reported that the Fulham Electricity Committee has recommended that the six men who were concerned in the recent strike episode at the Fulham electricity works be taken back as vacancies arise, at the discretion of the engineer, on the strict understanding that a repetition of such action will be visited with instant dismissal without any hope of reinstatement.

Awards to Inventors' Report.—The fourth report of the Royal Commission on Awards to Inventors has been published as a Parliamentary Paper (Cmd. 2,656, H.M. Stationery Office, price 2d. net). It relates to the proceedings of the Commission from August 1st, 1924, to December 31st, 1925. The Commission sat on 46 days and dealt with 39 cases; the Investigating Committee dealt with 60 claims and heard 14 of the claimants in person. Particulars of the claims actually heard are given in appendices of the report. Awards varying from £200 to £2,500 were granted in respect of several wireless apparatus inventions.

Cooper's Hill War Memorial Prize.—The triennial award of the above prize which fell to the Council of the Institution of Electrical Engineers last year is still at their disposal, no papers having been submitted. The Council have selected the following seven subjects, and members are invited to submit for consideration not later than October 31st a paper on any one of them:—

"The Use of Electricity in Public Works."
"Hydro-Electric Power in Rural Districts."
"Electrification of Railways."
"Electricity in Agriculture."
"Electric Railways in the Empire Overseas."
"Hydro-Electric Resources in the Empire Overseas."
"The Line and Wireless Communication of India."

Only corporate members of the Institution who were under 30 years of age on January 1st, 1926, are eligible for the prize, which consists of: (1) A bronze medal; (2) a parchment certificate of award; (3) a money prize of the value of about £25.

Appointments Vacant.—Shift engineer for the Eccles Corporation electricity works. Shift engineer for the Hong-Kong Electric Co., Ltd. District engineer for the Electricity Distribution of North Wales and District, Ltd. General manager and engineer for the Rhondda Tramways Co., Ltd. Electrical engineers for the Public Works Department, Government of Burma. Meter room assistant for the Stepney Borough Council Electricity Department. (See our advertisement pages to-day.)

Hospital Equipment.—In the new buildings of University College Hospital, London, having a total content of about 4,000,000 cubic feet, new boiler plant has been installed for the heating of the whole of the hospital buildings. From a central control room the heating, hot-water and steam services throughout the buildings are regulated, with the aid of electrical distant thermometers in all the wards, &c. The four kitchens are all equipped with apparatus for cooking by steam, gas, and electricity, automatic electric lifts, and electric ventilating fans, and washing-up is done with electrically-driven steam-heated washers, which enables one maid in half-an-hour to do work which formerly occupied several women for the whole afternoon. Refrigerating plant is also installed. All the sterilisers can be operated by either steam or electricity. The whole of the engineering work was designed by Mr. A. H. Barker, M.Inst.C.E., consulting engineer to the hospital.

Large Italian Transformers.—The Società Industriale San Giorgi, of Turin, is at present constructing three oil transformers with external water cooling, for the Terni steelworks, which are notable from the point of view of their size. Each of the transformers, which will weigh about 134 tons, will have a continuous capacity of 43,000 kVA, and is intended to deal with 10,100/143,300-V 45-period energy.

Association of Consulting Engineers.—The 12th annual general meeting of the Association of Consulting Engineers (Inc.) was held on May 27th, when the report of the committee for the 12 months ended April 30th, 1926, was presented. The membership of the Association at the end of the period under review was 110. The income for the year was £467, being £51 in excess of the expenditure.

Institution Notes.

Institution of Electrical Engineers.—JUBILEE OF THE TELEPHONE.—The fiftieth anniversary of the telephone will be celebrated by the Institution on June 24th, 1926, and in that connection the President and Council are giving a luncheon at the Hotel Cecil on that day. A meeting is also to be held at 3.15 on the same afternoon in the lecture theatre, when the Faraday Medal of the Institution will be presented to Colonel R. E. B. Crompton, C.B., honorary member and past-president. The presentation will be followed by a lecture by Sir Oliver Lodge, D.Sc., F.R.S., on "The History and Development of the Telephone." The Institution conversazione will take place in the evening.

Institution of Public Lighting Engineers.—CONFERENCE.—The annual conference of the Institution is to be held at Newcastle from September 14th to 16th next, and municipalities throughout the country are being invited to be represented. Mr. H. Dickinson, City Electrical Engineer of Liverpool, will read a paper at the conference on "Some Aspects of Electric Street Lighting in Liverpool." We are informed that Mr. Alexander C. Cramb, M.I.E.E., engineer and manager of the Electricity Department, Croydon, has accepted the invitation of the Council of the Institution to take the office of vice-president so as to become president of the Institution in 1927, when the annual conference will take place at Brighton.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The *Birmingham Post* states that the Wolverhampton Electricity Committee has accepted the resignation of the borough electrical engineer, Mr. S. T. ALLEN, following his appointment as engineer and manager of the West Midlands Joint Electricity Authority. The Committee recommended the appointment of the present assistant engineer, Mr. E. MORGAN, as his successor, but when the matter was discussed by the General Purposes Committee there was a sharp division of opinion, and the General Purposes Committee passed a resolution that the post should be advertised. The salary proposed was £1,000 per annum, with two annual increments of £125 per annum, and it was not proposed to appoint a successor to Mr. Morgan. The Electricity Committee pointed out that the generating station would be transferred to the West Midlands Joint Authority probably at the end of the current financial year, and it was considered advisable to have an engineer familiar with the undertaking. The matter came before the Town Council on June 14th, when it was decided to appoint Mr. Morgan to the position at a salary of £1,000, without the proposed annual increments.

Mr. EDGAR SHUTT, who has retired after 19 years' continuous service in the meter department of the Blackpool Corporation Electricity Department, was recently presented with an easy chair by the staff. Mr. C. Furness, chief engineer, made the presentation.

At the annual meeting of the Ayrshire Electricity Board, ex-Provost MATTHEW SMITH, O.B.E., Kilmarnock, was unanimously reappointed chairman of the Board. Police-Judge SMITH, Ayr, and ex-Bailie DAVID JONES, Kilmarnock, were unanimously re-elected conveners of the Finance and Engineering Committees respectively.

Mr. A. J. HOWARD, borough electrical engineer, Taunton, left Southampton on Saturday last on the *Berengaria* for a health and pleasure trip, at his own expense, to U.S.A. and Canada, where he will have an opportunity of studying electrical developments.

Mr. P. G. RUDD has resigned his position as sales manager with the Solidite Manufacturing Co., Ltd. His private address is 13, Courtley Avenue, Clapham Common, S.W.

Mr. H. G. WRIGHT, A.M.I.E.E., engineer and manager, The Cleveland Trust, Ltd., Electricity Works, Saltburn-by-the-Sea, has been appointed electrical engineer to the Aldershot Gas, Water and District Lighting Co., and will take up his duties on June 24th.

Mr. W. D. DAWES, London manager and secretary of the Anglo-Argentine Tramways Co., Ltd., has been appointed managing director of the company, and the assistant secretary, Mr. J. S. ANDERSON, has been appointed secretary.

Mr. J. T. GREEN, who has been with the Liverpool Electric Cable Co., Ltd., since its formation in 1901, as chief clerk, assistant secretary and branch manager, has relinquished his connection with the company. His address is 51, Devonfield Road, Orrell Park, Liverpool.

Mr. C. W. PEARCE, late works manager of the Dynamo and Motor Repairs, Ltd., has been appointed works manager of Manda Motors, Ltd.

Obituary.—LORD STEVENSON.—We regret to record the death of Lord Stevenson at the early age of 53 years. As Mr. James Stevenson he rendered important organising service to the Ministry of Munitions during the war; in 1921 he was appointed to the Committee which subsequently became responsible for the Stevenson rubber restriction scheme; and when the British Empire Exhibition was in process of organisation he was appointed chairman of the Standing Committee.

MR. H. HOLLIDAY.—We regret to learn of the death, which took place on June 12th, of Mr. Harry Holliday, manager of the Rhondda Tramway Co. He was 40 years of age, and was the eldest son of the late Mr. T. B. Holliday, a former manager of the tramways at Hastings.

New Companies Registered.

Record Corporation, Ltd. (213,768).—Private company. Registered May 13th. Capital, £35,000 in 25,000 preference shares of £1 each and 20,000 ordinary shares of 10s. each. To acquire the business of engineers and manufacturers of "Record Silent" engines for industrial, electric lighting, marine and other purposes, and all or any of the assets of that business, including the British and foreign patents and patent rights now belonging to W. O. Larmuth in connection therewith. The subscribers (each with one preference share) are:—H. F. Heal, 57, South Oak Street, Burton-on-Trent, secretary; C. F. Rossiter, The Elms Cottage, Sutbury, Burton-on-Trent, works manager. The first directors are to be appointed by the subscribers. Qualification, £100 shares or stock. Remuneration as fixed by the company. Secretary: H. F. Heal. Solicitors: Addleshaw, Sons & Latham, 15, Norfolk Street, Manchester.

Traders Magneto and Dynamo Co., Ltd. (7,485).—Private company. Registered in Dublin on May 4th. Capital, £1,000 in £1 shares. Objects: To carry on the business indicated by the title and that of manufacturers and hirers of and dealers in motor-cars, motor cycles, cycle cars, cycles, &c. The directors are:—A. J. Doyle, 74, Hannaville Park, Terenure, Dublin, motor factor and engineer; Mrs. C. C. Callaghan, Ferndene, Stradbrook, Blackrock, Co. Dublin; M. B. Doyle, 74, Hannaville Park, Dublin.

American Radio Corporation, Ltd. (214,190).—Private company. Registered June 7th. Capital, £500 in 495 6 per cent. cumulative preference shares of £1 each and 100 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in wireless accessories of all kinds, &c. The permanent directors are:—F. N. Coni, 71, Amesbury Avenue, Streatham Hill, S.W.16; L. C. Curd, 11, Springfield Gardens, Upper Clapton, E.5; F. Parlett, 26, Queen's Gardens, W.2. Remuneration as fixed by the company. Secretary: L. C. Curd. Solicitors: Pollock, Booth and Addis, Milton House, 35, Surrey Street, W.C. Registered office: 18, Conduit Street, W.1.

Grosvenor Battery Co., Ltd. (214,180).—Private company. Registered June 5th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and repairers of, agents for and dealers in electrical goods, equipment and accessories of all kinds, fittings, switchboards, recorders, indicators, bells, clocks, time switches and batteries; manufacturers of, agents for and dealers in instruments and accessories used in connection with radio-telegraphy, &c. The subscribers (each with one share) are:—W. G. Adie, Fels Farm, Eastbrook End, near Romford, Essex, merchant; M. G. Chant, 70a, Basinghall Street, E.C.2, C.A. Directors: F. Goodchild and W. G. Adie. Remuneration, £50 each per annum.

Berk and Dundas Fox, Ltd. (214,258).—Private company. Registered June 10th. Capital, £2,000 in £1 shares (1,800 5 per cent. preference and 200 ordinary). Objects: To carry on the business of electricians, mechanical and wireless engineers, manufacturers of and dealers in all apparatus for use in connection with the generation, distribution, supply and employment of electricity and radio power, small hardware merchants, fancy goods merchants, gold and silver smiths, watch and clock makers, manufacturers and repairers of and dealers in motor cars, &c. The first directors are:—A. Berk, 28, Hanover Square, Bradford; W. Dundas Fox, 25, Blenheim Road, Bradford (both permanent, subject to each holding 10 ordinary shares). Qualification of ordinary directors, 10 preference or ordinary shares. Remuneration as fixed by the company. Solicitor: D. G. Ineson, 1, Northgate, Cleckheaton. Registered office: 86a, Manningham Lane, Bradford.

Electric Brush Co., Ltd. (214,195).—Private company. Registered June 7th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in electrical brushes, appliances and implements, mechanical and electrical apparatus and articles required for use in connection with the toilet or massage, or for the stable or for recreation or amusement, &c. The subscribers (each with one share) are:—S. Cronin, 31-4, Basinghall Street, E.C.2, solicitor's clerk; F. Cockayne, 31-4, Basinghall Street, E.C.2, solicitor's clerk. The first directors are to be appointed by the subscribers. No share qualification required. Solicitors: McKenna & Co., 31-4, Basinghall Street, E.C.

Official Returns of Electrical Companies.

Thames Electric Wireless Co., Ltd.—H. C. Mundy, of 93 and 94, Chancery Lane, W.C.2, was appointed receiver and manager on May 3rd, 1926, under powers contained in first mortgage debentures dated July 4th, 1923.

Gil-Ray Trading Corporation, Ltd.—Debenture dated May 20th, 1926, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: G. A. Anderson, 11, River Street, Rhyl, North Wales.

Erith Electrical Co., Ltd.—R. B. Tyler, C.A., of 1, Queen Victoria Street, E.C.4, ceased to act as receiver or manager on May 18th, 1926.

West London and Provincial Electric Supply Co., Ltd. (62,097).—Capital, £150,000 in 70,000 ordinary and 80,000 preference shares of £1 each. Return dated April 7th, 1926. 23,354 ordinary and 40,077 preference shares taken up. £37,431 paid on 15,854 ordinary and 41,577 preference shares. £15,000 considered as paid on 7,500 ordinary and 7,500 preference. Mortgages and charges, nil.

Wycombe Borough Electric Light and Power Co., Ltd. (53,133).—Capital, £125,000 in 20,000 ordinary and 5,000 preference shares of £5 each. Return dated April 27th, 1926. 15,000 ordinary and 3,000 preference shares taken up. £90,000 paid. Mortgages and charges, £40,000.

Brompton and Kensington Electricity Supply Co., Ltd. (25,913C).—Capital, £300,000 in £1 shares. Return dated April 1st, 1926. All shares taken up. £199,845 paid. £100,155 considered as paid. Mortgages and charges, nil.

Erskine, Heap & Co., Ltd. (126,262).—Capital, £50,000 in £1 shares. Return dated April 1st, 1926. 45,489 shares taken up. £7,826 paid. £37,663 considered as paid. Mortgages and charges, nil.

Cambridge Electric Supply Co., Ltd. (36,457).—Capital, £100,000 in £10 shares. Return dated March 31st, 1926. All shares taken up. £100,000 paid. Mortgages and charges, £75,000.

Charing Cross Electricity Supply Co., Ltd. (29,122).—Capital, £2,240,000 in 400,000 preference, 900,000 ordinary, 400,000 City Undertaking preference, and 550,000 City Undertaking ordinary shares of £1 each. Return dated March 18th, 1926. 400,000 preference, 576,000 ordinary, 400,000 City Undertaking preference, and 550,000 City Undertaking ordinary shares taken up. £1,280,000 paid. £646,000 considered as paid. Mortgages and charges, £1,336,178.

Cecil Hodges & Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated May 20th, 1926, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Allen, West & Co., Ltd. (108,870).—Capital, £150,000 in £1 shares. Return dated December 31st, 1925. 141,724 shares taken up. £141,724 paid. Mortgages and charges, £60,000.

Douglas Southern Electric Tramways, Ltd. (45,701).—Capital, £50,000 in 30,000 preference and 20,000 ordinary shares of £1 each. Return dated December 24th, 1925. 25,973 preference and 15,472 ordinary shares taken up. £18,370 paid on 12,566 preference and 5,804 ordinary. £23,075 considered as paid on 13,407 preference and 9,668 ordinary. Mortgages and charges, £1,376.

Smithfield Markets Electric Supply Co., Ltd. (53,354).—Capital, £100,000 in 60,000 shares of £1 each and 8,000 shares of £5. Return dated March 11th, 1926. 60,000 £1 shares taken up. £60,000 paid. Mortgages and charges, £16,170.

Northallerton Electric Light and Power Co., Ltd. (59,301).—Capital, £6,500 in 2,900 preference shares of £1 each and 12,000 ordinary shares of 6s. each. Return dated March 10th, 1926. 1,161 preference and 7,829 ordinary shares taken up. £3,509 paid. Mortgages and charges, £3,900.

British Columbia Electric Railway Co., Ltd. (51,953).—Capital, £5,000,000 in £1,440,000 5 per cent. cumulative perpetual preference stock, £1,440,000 preferred ordinary stock, £1,440,000 deferred ordinary stock, and £680,000 shares of £1 each (unissued). Return dated January 6th, 1926. £4,320,000 stock taken up. £4,120,000 paid on £1,440,000 5 per cent. cumulative preferred preference, £1,440,000 on preferred ordinary stock, and £1,240,000 on the deferred ordinary stock. £1 15s. paid up on 7 forfeited shares. £200,000 considered as paid on £200,000 deferred ordinary stock. Mortgages and charges, £3,851,870.

W. E. Dove & Co., Ltd.—Capital, £3,500 in £10 shares. Return dated March 8th, 1926. 320 shares taken up. £2,000 paid. £1,200 considered as paid. Morgages and charges, £800.

Gosport and Alverstoke Electric Lighting Co., Ltd. (82,693).—Capital, £35,000 in £10 shares. Return dated July 8th, 1925 (filed April 7th, 1926). 2,500 shares taken up. £25,000 paid. Mortgages and charges, nil.

Lymington Electric Light and Power Co., Ltd. (57,985).—Capital, £30,000 in 4,600 ordinary and 1,400 preference shares of £5 each. Return dated April 21st, 1926. 4,600 ordinary and 1,285 preference shares taken up. £23,425 paid. Mortgages and charges, £9,000.

Camborne Electricity Supply Co., Ltd. (57,950).—Capital, £10,000 in £1 shares. Return dated May 13th, 1926. 605 shares taken up. £605 paid. Mortgages and charges, nil.

Win-Sum Electric Diffusers, Ltd.—G. A. Siday, of Plant House, Ealing, W.5, was appointed receiver and manager on June 1st, under powers contained in debentures dated February 2nd, 1926.

H. L. Wood & Son, Ltd.—T. Delaney, of 88, Fleet Street, E.C., was appointed receiver on May 31st, 1926, under powers contained in debentures dated November 17th, 1925.

Rhayader Electric Light and Power Co., Ltd.—Mortgage by demise dated May 29th, 1926, to secure £300 charged on certain property at Rhayader, rights and easements, &c. Holder: A. G. Richardson, Bryncoed, Rhayader.

F. Geere Howard, Ltd.—Satisfaction in full on May 31st, 1926, of debentures dated August 10th, 1922, securing £6,250.

County of Durham Electrical Power Distribution Co., Ltd. (61,591).—Capital, £535,000 in £1 shares. Return dated March 31st, 1926. All shares taken up. £535,000 paid. Mortgages and charges, £250,000.

British Insulated Cables, Ltd. (52,285).—Capital, £2,000,000 in 1,333,333 ordinary, 500,000 preference, and 166,667 unissued shares of £1 each. Return dated April 5th, 1926. 1,333,333 ordinary and 500,000 preference shares taken up. £1,400,008 paid on 1,033,658 ordinary and 372,350 preference shares. £427,325 considered as paid on 299,675 ordinary and 127,650 preference shares. Mortgages and charges, £700,000.

British Insulated Cables (S.A.), Ltd. (formerly Telegraph Manufacturing Co. (Colonial), Ltd.) (71,854).—Capital, £2,000 in £1 shares. Return dated March 24th, 1926. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Electro-Metals, Ltd. (110,432).—Capital, £30,000 in 4,000 preference shares of £5 each and 10,000 ordinary shares of £1 each. Return dated December 28th, 1925. 102 preference and 10,000 ordinary shares taken up. £510 paid on the preference shares. £10,000 considered as paid on the ordinary shares. Mortgages and charges, nil.

Whitchurch and Pangbourne Electric Supply Co., Ltd. (75,400).—Capital, £10,000 in 1,700 ordinary and 300 preference shares of £5 each. Return dated May 19th, 1926. 1,700 ordinary shares taken up. £8,500 paid. Mortgages and charges, nil.

Wellingborough Electric Supply Co., Ltd. (65,747).—Capital, £50,000 in £10 shares. Return dated March 11th, 1926. 4,500 shares taken up. £45,000 paid. Mortgages and charges, £17,500.

Ericsson Telephones, Ltd. (formerly the British L.M. Ericsson Manufacturing Co., Ltd.) (79,061).—Return dated April 13th, 1926. Capital at date of return, £200,000 in 99,990 preference and 100,010 ordinary shares of £1 each (increased April 14th, 1926, to £500,000 in 199,970 preference and 300,030 ordinary shares of £1 each). 99,990 preference and 100,010 ordinary shares taken up. £170,000 paid (being £1 per share on 50,010 ordinary and 99,990 preference and 8s. per share on 50,000 ordinary shares). £30,000 considered as paid (being 12s. per share on 50,000 ordinary shares). Mortgages and charges, £100,000.

Gent & Co., Ltd. (78,797).—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1 each. Return dated March 9th, 1926. 4,427 preference and 20,876 ordinary shares taken up. £6,887 paid on 957 preference and 5,930 ordinary shares. £18,416 considered as paid on the remainder. Mortgages and charges, £16,509.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

British Electric Traction Co., Ltd.

The annual meeting was held on June 11th, Mr. J. S. Austen (chairman) presiding. The chairman briefly reviewed the working of the past year. It would be seen, he pointed out, that the Company had earned £14,000 more than in the previous year, and was able to recommend the payment of 8 per cent. on the ordinary stock, against 7 per cent. That was the fourth consecutive year in which they had been able to raise the dividend by one per cent. Early last year they became anxious because they were not going to receive a dividend upon their holding in the Scottish General Transport Co., whereas they had received over £11,000 in the previous year. That loss had been made good. After the payment of the ordinary dividend they were able to add about £22,500 to their undivided profits account, making that account practically £300,000. There were many stockholders who would like to see those undivided profits represented by a certificate, in other words, they would like to have a stock bonus. Theoretically, there was no benefit to the stockholders in the stock bonus, because the dividend paid on it would otherwise have been distributed as an extra dividend on the ordinary stock, and in practice there were many difficulties attached to a stock bonus. They had to be careful that they did not infringe the rights of the holders of the preferred stocks. The rights of the latter were that, in the first place, they were entitled to a dividend of 6 per cent., following which the ordinary stock received 8 per cent., and then they shared equally until the preferred had received 8 per cent., after which they had no further participation. So that if they were to make a distribution of ordinary stock, they would, in fact, be paying a certain amount in front of the preferred stock. He thought, however, that he could put before them a scheme that would obviate that difficulty. Stating the terms in round figures, supposing they found themselves in the position to distribute an extra £20,000. Of that sum, £7,000 would belong to the preferred stockholders, and £13,000 to the deferred stockholders. It was obvious that it would make no difference to the preferred holders, so long as they got their £7,000, what happened to the £13,000. So that if they were to create a deferred stock it would not matter to the preferred whether that £13,000 went to the ordinary stock or to the new deferred ordinary stock. In other words, the scheme would be to turn the ordinary stock into an 8 per cent. ordinary stock, or to limit the dividend on the ordinary stock to 8 per cent., and then to give to the ordinary stock some deferred stock which would receive all over the 8 per cent. the ordinary was now entitled to receive. That was the scheme the directors had in their minds, and that being the case, it was only right the shareholders should know it. If they wished to know when the scheme was likely to materialise, the answer was as soon as they found themselves in the position to make extra distribution upon the preferred stock. Owing to the uncertainty of the effects of the general strike and the coal stoppage he could not say more. He expressed the hope that if they were not able to do it this time next year, they would at least then be in the position to indicate a fairly close date when it would take place. Mr. Baldwin asked what there was to prevent a cash distribution instead of a distribution of stock. The company was interested in the Underground Group in investment in the London & Suburban & Associated Construction Companies, which had in the past year shown but poor results, and he thought some scheme might be put forward whereby in the event of any amalgamation scheme and a reconstruction of the capital of the Underground Railway Companies, they could come in as shareholders in a common fund stock. The chairman, in reply, said as far as he could say, there would be no legal objection to the distribution mentioned by the last speaker, except that it had not been considered advisable in the past to divide the profits right up to the hilt, which policy still continued. If they did such a thing they would have to reduce their dividend on the ordinary stock and he could not see that any benefit would arise from such action. As regarded the possible Underground amalgamation, that was far too big a question to be dealt with that day. There was already in existence a scheme by which receipts were pooled, but the procession of evolution must be, necessarily, slow and could not be hurried. He looked forward to the day when the whole of the means of traction in London would be in the one hand. The report and accounts were adopted.

Electric Construction Co., Ltd.

The annual general meeting was held on June 10th, Mr. P. E. Beachcroft (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, June 11th, p. 882) the chairman expressed the board's regret at the death of Sir Henry Mance, who had been connected with the company for over 33 years. Mr. W. M. Furniss, the manager of the works at Wolverhampton, had been appointed to fill the vacancy on the board. Although the crisis through which the country had recently passed did not actually occur within the year under review, the preceding unrest seriously affected operations in almost every industry, with the result that the general conditions of trading were rendered extremely difficult, and although inquiries for new machinery and equipment were numerous, the placing of orders was greatly retarded. They were therefore justified in congratulating themselves on being able to present a satisfactory report. The general strike did not directly affect the company to any extent, as the workpeople were not called out until two days before the strike ended, and a very small percentage only suspended operations then. There was undoubtedly a solid foundation for belief that, if further labour troubles did not intervene, a long period of prosperity lay before the electrical industry. In whatever form the Electricity Bill now before Parliament became law, it could not fail to create a very large demand for electrical plant and apparatus for the stations to be erected and for new consumers. Moreover, the interconnection of those large stations, involving the standardisation of the frequency of supply, would render obsolete a great deal of existing electrical machinery.

Thus the outlook for manufacturers was exceedingly good, but it might be a year or two before any benefit was derived from the new legislation. The chairman then reviewed the accounts, and said that during the past financial year they had purchased and cancelled £3,700 of debenture stock, the discount, amounting to £921, having been added to the general reserve fund, which now amounted to £165,921. That fund, together with the dividend equalisation fund and the undivided profits, amounting to the sum of £217,458, being invested entirely in gilt-edged securities, the financial position of the company left nothing to be desired. With regard to the immediate outlook he was pleased to say that since the beginning of the new financial year the orders had exceeded those of the corresponding period of last year. As, however, extensions to central stations were, to a large extent, suspended until the Electricity Bill had been passed, and as there were still no indications of the mining dispute or the general depression in trade coming to an end, it was impossible to speak with any assurance as to the future, but he had no doubt that they would continue to secure their fair share of what business was going. They had just completed negotiations for the acquisition of the goodwill of Sandycroft, Ltd., relating to the manufacture of electrical machinery and switchgear, with the exception of certain specialities. The acquisition included the sole manufacturing rights of the well-known cascade machines and one-half share of the patents taken out by Sandycrofts jointly with the inventor—Mr. L. J. Hunt—who was to act in an advisory capacity for the company solely, for a period of three years. They were confident that those arrangements would add considerably to their turnover as soon as the machinery and tools, &c., purchased from Sandycroft, Ltd., had been transferred to their own works at Wolverhampton.

Eastern Telegraph Co., Ltd.

Sir John Denison-Pender, G.B.E., presiding at the annual meeting on June 8th, said that the agreements with the Eastern and South African, the Europe and Azores, and the West African Telegraph Companies came into force on January 1st, 1925, and as a result there had been a considerable augmentation in both the revenue and the expenditure which made comparison with 1924 impossible. The financial result was satisfactory having regard to the depressed state of trade; the increased available balance was chiefly due to a reduction of £81,000 in respect of taxation and the interest on the loan from the Eastern and South African Co. The dividend had been maintained at 10 per cent. free of tax, while the contribution to reserve and the balance carried forward had been increased. The reserves were being rearranged; the sum of £860,000 appearing as " Provision on account of investment fluctuations " was in excess of the amount required, but it was proposed to leave it undisturbed to meet any possible future contingencies. Referring to the pensions provisions, the chairman said that it was the practice of the board to supplement retiring allowances in consonance with the increased cost of living. The International Telegraph Conference in Paris last year discussed many matters, the principal one being the question of increasing the charges for code language. The Eastern Companies' representatives declared themselves against any disturbance of existing conditions; a committee was appointed to go into the matter and report to the next International Conference. The companies' delegates also opposed any increase in charges. The chairman said that although Government administrations had sanctioned increases the company's tariffs remained at the pre-war level. The position in Greece and Turkey remain practically unaltered. The change of Government in Turkey had delayed negotiations, while the revenue from the Greek traffic still gave the company a very small return. If the company could not secure an adequate margin of profit it would be obliged to close down in Greece and dismiss its Greek staff, numbering nearly 500. After lengthy negotiations with the French Administration, it was hoped that a special wire between London and Paris would shortly be leased to the company, with permission to deal direct with the public in Paris. New offices had accordingly been secured in that city. Two recent improvements were mentioned by the chairman, *viz.*, the use of " loaded " cables and the invention of a " regenerator " by the company's staff. That apparatus overcame the disabilities inherent in the old system of relaying from one cable to another which only permitted reduced speeds owing to distortion. The regenerator increased the speed of transmission by over 35 per cent. and a further gain was secured by a reduction of stoppages, making an overall improvement of 48 per cent. A considerable speeding-up had been effected during the past year or two. In conclusion, the chairman mentioned the retirement from the board of Sir Robert Kindersley and the appointment of Mr. H. C. Hambro in his place.

United River Plate Telephone Co., Ltd.

The annual meeting was held on June 8th under the chairmanship of Mr. Percy Cross. In moving the adoption of the report and accounts (*vide* our last issue, p. 882), Mr. Cross said that the results of the past year's working were very good. During the year issues of new capital amounting in the aggregate to £1,320,000, had been made; the position and prestige of the company had enabled it to raise the money without difficulty. The capital expenditure had very nearly reached the million-pound mark forecast last year. The connecting of new subscribers had been retarded by delays in the delivery of equipment, but the number had been increased by 10,805 to 141,251. That was a net increase, taking into account changes of address and withdrawals of subscribers; actually 30,000 new lines were installed. There were still 5,000 people awaiting service in Buenos Aires and district. Orders had been placed for equipment which should be sufficient to meet all demands up to January, 1929. The rapidity of development had prevented the company from having that reserve of spare plant which a city of the magnitude of Buenos Aires should possess, but they were doing their best to hasten the manufacture of the apparatus. The company was now in its fortieth year and it had continually kept abreast of developments. Its immediate aim was the provision of automatic exchanges as rapidly as possible. Thirteen of those exchanges were already working in Buenos Aires, Rosario, Cordoba and Santa Fé and six more were in course of erection in the capital, all of which, it was hoped, would be in service early next year. This would give the company an automatic equipment embracing 76,000 lines. They were doing their best to educate subscribers in the use of the automatic system. The work of connecting up Bahia Blanca, 500 miles from Buenos Aires, was completed during the year and the President of the Republic performed the opening ceremony. The company was installing repeating equipment in Buenos Aires which would enable calls to be made between Cordoba and Bahia Blanca, a distance of nearly 1,000 miles. The traffic between those important cities was encouraging and additions would soon be rendered necessary. The trunk service was increasing to such an extent that it would probably be necessary to substitute cable for the existing overhead lines between Buenos Aires and Rosario and Mar del Plata. That would involve heavy expenditure which, however, would be justified within a short period. If necessary the Government would be asked to sanction increased rates for the seasonal traffic between Buenos Aires and Mar del Plata. The matter was still being studied, but it could not be completed for some time. Further capital would be required and the shareholders were asked to approve an increase in the nominal share capital from £5,000,000 to £6,000,000 by the creation of 200,000 £5 shares which would be issued at the appropriate time. After giving some statistics of the company's system the chairman referred to the visit of the Prince of Wales to Argentina, when the local chairman was honoured, and to the recent death of Dr. O'Farrell, a former local chairman. The report and accounts were adopted and the proposed increase in the capital was approved.

Cawnpore Electric Supply Corporation, Ltd.

Mr. J. G. B. Stone occupied the chair at the annual meeting on June 8th and in the course of his speech said that the earnings, the surplus available and the amount of energy sold had all increased. The load factor had improved on account of an increase in the amount of electricity supplied for industrial purposes. The working expenses of both the electricity supply and traction undertakings had increased with the increased business. The traction expenses had been increased by a new item—two motor omnibuses which the company was running as an experiment with a view to meeting competition. The capital expenditure in India during the year was £126,433. That represented expenditure upon the extension of the Riverside station, the payment for which had been completed within a few thousand pounds, and new mains. Mr. Stone said that in the course of a recent visit to India he gathered that Cawnpore was growing in importance as a manufacturing city and the company's prospects were good. Great benefit should accrue from the railway reconstruction which was in hand. At present the company was only dealing with half the load which it could carry but in spite of that its rates compared favourably with those in other Indian cities, where facilities for cheap coal were better. The report and accounts were adopted.

India Rubber, Gutta Percha and Telegraph Works Co., Ltd.

In a circular issued to the shareholders under date June 14th, the directors report that the company's trading for the half-year to the end of February was satisfactory. Compared with the corresponding period of last year practically all departments showed improvement. There had been a falling off in the wireless section of the business, but this was much more than covered by the general increase in other directions. The debentures of £400,000 which became due for payment in March were paid off and replaced by a similar issue; the issue was considerably over-subscribed. The interruption of the general strike and the coal trouble will adversely affect the second half of the financial year and it is not yet possible to estimate, even approximately, the effect of these difficulties on the year's results. In these circumstances the directors are unable to recommend the payment of an interim dividend on the ordinary shares, but the half-yearly dividend on the preference shares will be paid as usual on July 1st.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The annual meeting was held on June 10th. Sir John Denison-Pender, C.B.E., who presided, said that the gross revenue had fallen owing to the reduction of the rates for Australasian traffic. The reduction had, however, been offset by an increase in the volume of traffic in the Straits Settlements and by a slight increase in the Australasian traffic. The former increases in response to tariff reductions could no longer be counted on owing to the existence of lower special rates. During the year two cable ships were sold and their capital cost, less receipts from their sale, was written off. The ships' reserve had again been strengthened after that operation. A

loss on the sale of investments had occurred owing to the fall of the franc but steps had been taken to guard against a repetition of the loss. The duplication of the Cocos-Fremantle section, by means of cable of the "loaded" type, was successfully completed in March. The cable was not yet in full use as experiments to obtain reliable signals at maximum speed were being carried out. An agreement had been made with the Commonwealth Government for the lease of a fast-working land line between Fremantle and Adelaide (1,676 miles) to connect with the new cable. A new office was being constructed at Fremantle and should be completed at an early date. The Darwin office was being enlarged to accommodate the installation of automatic working. The negotiations with the Chinese Telegraph Administration had made no progress and weekly settlements were being enforced. So far payments had been made regularly. The report and accounts were adopted.

Telephone Manufacturing Co., Ltd.

The directors report that there was a loss on trading of £21,212 for the year ended December 31st last, after charging interest, &c., amounting to £32,165 and placing £7,000 to the contingency reserve. For the nineteen months ended December 31st, 1924, there was a net loss of £46,258. The report states that the trading has been handicapped by stringent financial conditions, but nevertheless, an improvement occurred during the year under review. Since the close of the year a scheme for the reorganisation of the company's finances has been adopted and sanctioned by the Court. This will enable the company to discharge the whole of its indebtedness to the bank and to redeem the whole of the income bonds, thereby freeing itself from all interest and other charges. Further working capital will also be provided. The effect of the scheme is already manifest as the amount of work in hand at the close of last month was nearly five times as much as at the corresponding period of 1924. The meeting was to be held yesterday (Thursday).

Sir W. G. Armstrong, Whitworth and Co., Ltd.

The annual meeting of the Company was held on June 8th, when Lord Southborough explained that he had recently been appointed chairman, while Sir Glyn West had resigned, with certain of the directors. Mr. Frater Taylor and Sir A. Kaye Butterworth had joined the board. The chairman then outlined the history of the company since its inception and said that its present difficulties were mainly due to the necessity for finding other work to employ the large works which had been erected or acquired during the war. Other circumstances which had contributed to the position were the investing of large sums in works which had not proved profitable—or immediately profitable, and the acceptance of large orders showing a small margin of profit or on deferred payment terms. The company's affairs were being thoroughly investigated by Mr. Frater Taylor, who had had wide experience, and it was hoped to present a full report and recommendations in due course.

Delhi Electric Tramways and Lighting Co., Ltd.

The company's lighting and tramway undertakings had a net revenue of £45,019 for 1925. After deducting expenses and debenture interest, and adding £1,974 brought forward, there remains £46,882, which it is proposed to deal with as follows:—Depreciation of plant and equipment, £17,500; reserve for British and Indian taxation, £5,000; renewals reserve account, £5,000; employés' provident fund, £2,000; a dividend of 12 per cent. upon the preferred and participating shares, £12,000; and a dividend of 11.1724 per cent. on the ordinary shares, £3,240, leaving £2,142 to be carried forward. Additions costing £20,641 were made to the plant during the year, consisting chiefly of mains, sub-stations and converting plant. The agreement for a bulk supply from the Government generating station to assist the supply has not yet been completed. The meeting was to be held on Wednesday last.

German Companies.

The *Lloyd Dynamo Works Company*, Bremen, reports gross profits of 583,000 marks for 1925 as against 627,000 marks in the previous year. After providing for depreciation and taxes, the accounts show a loss of 158,000 marks, which is extinguished by the balance brought in and by an appropriation from the reserve fund.

The *Voigt and Haeffner Company*, Frankfort-on-Main, states that the exceptionally large volume of orders received in the early part of 1925, was followed by a sudden decline in the autumn, the result being a great increase in the stocks, which, however, have since been considerably reduced. Sale prices were much depressed and it was only about the end of the year that they were brought into some relation to the costs of production. The export trade continued to be exceptionally difficult. The accounts indicate net profits of 664,000 marks, as compared with 655,000 marks in 1924, the dividend remaining at 8 per cent., as in the preceding year.

The *Continental Company for Electrical Undertakings*, Nuremberg, which is a holding concern associated with the Schuckert Company, states that as a result of the growth of the number of consumers the general economic crisis did not fully affect the undertakings in which the company is interested. The financial requirements for extensions were very considerable. The net profit for 1925 amounted to 505,000 marks, as compared with 319,000 marks in the previous year, permitting of the payment of 6 per cent. on the preference shares of 1922, 6 per cent. on those of 1907, and 5 per cent. on the 1925-26 shares, as well as 4 per cent. on the few ordinary shares.

The *Accumulator Works Company*, Berlin and Hagen, reporting on the year 1925, states that extensive new orders for accumulators were received in the first half of the year, although prices in various branches were inadequate. The export markets were almost entirely closed as the costs of production owing to the burden of taxation were too high. During the year the orders diminished, owing largely to the sudden depression in the automobile industry, and large dismissals of workmen had to be made. New orders for starter batteries, for the mass production of which the workshops had been reconstructed, almost entirely ceased. A beginning was made during the year with the systematic establishment all over Germany of charging stations and repair workshops. After writing off 683,000 marks for depreciation, the accounts show net profit and balance forward amounting to 1,929,000 marks, as against 1,200,000 marks in the previous year; the dividend is raised from 5 to 8 per cent.

Austrian Companies.

The shareholders of the *Upper Austrian Water Power and Electric Co.* have approved the directors' scheme of capital reorganisation on a schilling basis. The share capital has been fixed at 12,000,000 schillings, divided into 1,200,000 shares of a nominal value of 10 schillings each. The shareholders will obtain one new share for each 50 old shares they surrender. The company will have a reserve of 3,200,000 schillings. The net profit for 1925 amounted to 666,257 schillings. A dividend of 5 per cent. will be distributed.—*Financial News.*

The accounts of the *Felten and Guilleaume Company*, Vienna, show net profits of 890,000 schillings for 1925, as against 870,000 schillings in the previous year, the dividend being at the rate of 2 schillings per share as in 1924.

Calcutta Tramways Co., Ltd.—The revenue for the year 1925 was £219,044 and the addition of £14,266 brought forward makes £233,310. After providing for debenture interest and preference and interim ordinary dividends there remains £15,956, which it is proposed to allocate as follows:—To depreciation reserve, £60,000; to general reserve, £28,000; written off suspense account, £7,289; to staff provident fund, £2,068; a final dividend of 3¼ per cent. on the ordinary shares (making 7¼ per cent. for the year) free of tax, £24,500; leaving £37,703 to be carried forward. The reduction of the dividend (from 10 per cent.) and the strengthening of the reserves is considered advisable by the directors on account of motor-omnibus competition, which, however, is said to be declining. The board is continuing its policy of extension of lines and services and increasing the number of omnibuses which act as feeders to the tramway system. Meeting: June 29th.

W. T. Henley's Telegraph Works Co., Ltd.—The accounts for the year ended March 31st last show a net profit of £311,029. From this is deducted £52,398, representing directors' fees, debenture interest, depreciation, &c., and a net balance brought forward of £477,396 is added, making £736,027. Income tax, reconstruction of Holborn Viaduct premises, transfer to reserve (£50,000) and preference and interim ordinary dividends absorbed £134,748, leaving a balance of £601,279. After paying a final dividend of 3s. per share on the ordinary shares (making 4s. for the year) the sum of £503,779 remains to be carried forward. The report records the death of Mr. M. Roberts, a director, and states that the company's business made satisfactory progress during the year under review. The meeting is being held to-day (Friday).

Barcelona Traction, Light and Power Co.—The revenue for the year ended December 31st, 1925, was $3,678,234, and the balance available $3,482,081. The service of bonds absorbed $2,233,985, and a total dividend of 5 per cent. has been paid for the year. The 7 per cent. prior lien "A" bonds were called for redemption on June 1st. The redemption of these bonds put the 6½ per cent. prior lien bonds in the position of a first specific charge upon the whole of the mortgaged assets of the company and a first floating charge upon its general undertaking and assets. The railway revenue decreased during 1925, but the earnings of the combined enterprises showed an increase.

Whitehall Electric Investments, Ltd.—The gross income during the year ended March 31st last was £708,522, as against £612,043 in 1924-25. The net income was £456,102, against £324,491. After providing for the preference dividend it is proposed to make a distribution of 2½ per cent. on the ordinary shares (as compared with *nil* last year), leaving £143,602 to be applied in reduction of discount on debenture stock. It is stated that during 1925 the Cia. Electrica de Tampico resumed payment of its preference dividend and that satisfactory results have been obtained by the other operating companies.

Oxford Electric Co., Ltd.—Messrs. Close Brothers announce that shareholders representing over 70 per cent. of the ordinary share capital of the company have accepted their recent offer for the purchase of the ordinary shares of the company at 28s. per £1 share (equivalent to £7 for the old £5 shares). As the offer was made subject to acceptance by the holders of at least 50 per cent. of the ordinary share capital it now becomes effective.—*Financial Times.*

Chloride Electrical Storage Co., Ltd.—A final dividend of 5 per cent. (actual), free of tax, has been declared, making 10 per cent., free of tax, for the year, plus a tax-free bonus of 2s. per share.

Globe Telegraph & Trust Co., Ltd.—A final dividend of 5s. per share (net) has been declared on the ordinary shares, making 10 per cent. (net) for the year, as in 1924

Kidderminster and District Electric Lighting and Traction Co., Ltd.—The net receipts for the past year amounted to £7,196, which was increased to £7,566 by the balance brought forward. After meeting expenses and allocating £1,000 to renewals and £800 to reserve, it is proposed to pay a dividend of 2½ per cent. on the ordinary shares, leaving £454 to be carried forward. The Kidderminster and Stourport Electric Tramway Co. made a profit of £19, which is added to a balance of £625 brought in and carried forward.

Manila Electric Corporation.—A dividend of 50 cents per share has been declared on the common stock in respect of the quarter ending June 30th.

The directors propose to issue 120,000 additional shares of common stock of no par value at the price of $33 per share and present stockholders are to be given preference. The issue is intended to provide for the redemption of the $3,419,300 outstanding first refunding mortgage gold bonds (due 1942) of the Manila Electric Company.

English Electric Co. of Australia, Ltd.—The net profit for the year ended March 31st last was £10,982, as against £5,601. A dividend of 2½ per cent. has been paid and £23,325 is carried forward. The previous year's dividend was 5 per cent., and 10 per cent. was paid in 1923-24.

Guest, Keen & Nettlefolds, Ltd.—The balance at credit of profit and loss for the year ended March 31st last is £948,297 and the addition of £223,808 brought forward makes available £1,172,105. As previously reported, the final ordinary dividend is 1s. per share, free of tax, again making 10 per cent., tax-free, for the year. £235,639 is carried forward.

Victoria Falls and Transvaal Power Co., Ltd.—The preference shares are to receive a final dividend of 1 per cent., making 10 per cent. for the past year, and a dividend of 3 per cent. in respect of the current half-year. The final dividend on the ordinary shares is 11 per cent., making 14 per cent. for the year, as compared with 12½ per cent. for 1924.

Anglo-Swedish Electric Welding Co., Ltd.—The accounts for the year ended March 31st show a net profit of £6,003, to which is added £5,349 brought forward, making £11,352. It is proposed to pay a dividend of 10 per cent. (against 8 per cent.), to put £3,000 to reserve, and to carry forward £4,602.

Oriental Telephone and Electric Co., Ltd.—The directors recommend a final dividend of 6 per cent. on the ordinary shares, free of tax, making 10 per cent. for the year, free of tax, and a bonus of 2 per cent. tax-free.

Anglo-Argentine Tramways Co., Ltd.—The directors have declared a dividend of 2¾ per cent. on the 5½ first preference shares and one of 3 per cent. on the 6 per cent. preference shares in respect of the half year ending June 30th.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted :—

Shropshire, Worcestershire and Staffordshire Electric Power.—50,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,160,601 to 1,210,600.

Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Lancashire United Transport and Power Co.—£250,000 6 per cent. first debenture stock, issued at 93 per cent., partly and fully paid.

Howard & Bullough, Ltd.—A final dividend of 2½ per cent. has been declared on the ordinary shares, making 10 per cent. for the year, as in 1924-25.

Shawinigan Water and Power Co.—A dividend of $2 per share on the common stock has been declared in respect of the quarter ending June 30th.

Pinchin, Johnson & Co., Ltd.—The usual half-yearly dividend at the rate of 6¼ per cent. has been declared on the preference shares.

Edgar Allen & Co., Ltd.—A dividend of 5 per cent., free of tax, is recommended on the ordinary shares. The 1924 dividend was 2½ per cent.

Brush Electrical Engineering Co., Ltd.—The annual meeting was held on June 14th; a report of the proceedings will appear in our next issue.

Cape Electric Tramways, Ltd.—The ordinary shares are to receive an interim dividend of 3 per cent., free of tax, as in 1925.

Stocks and Shares.

MONDAY EVENING.

CAPITAL continues to flow steadily into Stock Exchange markets. Notwithstanding the uncertainties which hang round the coal position, the investor is helping himself liberally to the new issues that are spread in profusion before him. There is a pronounced willingness to buy investment stocks, and, despite the competition of the newcomers, the older securities are in constant demand. New capital can be placed without any difficulty provided that the issuers have reasonably good stock to offer. The feature of the week so far as electrical descriptions are concerned, is the strength of Underground Electric Railway shares.

A House of Commons Committee has passed the preamble of the London Electric and the Metropolitan District Railway Companies' Bill for power to execute works and to raise additional capital. The estimated cost of the works is about £2,400,000 and the London Electric Company asks for power to raise additional money not exceeding on the whole a million pounds. Underground Electric ordinary shares have had a dramatic jump to 4. The price rose 10s. in a day, and rumour was exceedingly busy in weaving various causes to account for the persistent pressure to buy the shares. The chief reason was the expectation of a reorganisation plan to be published almost at once. It is declared, with a show of some authority, that the Underground Company's £10 shares are to receive 7 1/5 new shares of £1 each in a reorganisation, and that the 1s. "A" shares will be exchanged at the rate of 10 of these for 11 new shares. The income bonds have risen to 101. Districts, after a drop to 51½, recovered to 53. Metropolitans are a point lower on the week.

In the market for electricity supply shares, Kensingtons are better at 13¾ and Bournemouth & Poole recovered to 57s. 6d. The Brompton & Kensington Electricity Supply Company has announced to its customers that, as its electrical energy supply is generated exclusively by oil fuel, the restriction in consumption required by the Government order does not apply to the company's consumers. "You are therefore not called upon to practice," says the circular, "the economy demanded by the shortage of coal." Several of the preference shares are better. Midland Counties Electric hardened to a guinea. Whitehall Electric preference strengthened to 20s. 3d., upon the declaration of a dividend on the ordinary shares. This market as a whole shows a good deal of steadiness.

Cable stocks are good. Eastern ordinary gained 3¼, Eastern Extensions, Globes and Westerns have all advanced. This is due not only to the satisfactory reports published by the companies, but to the persistence of an investment demand to which reference has been made so constantly. Dividends deducted from the prices of such sound stocks and shares as are found in the Eastern group, are recovered promptly, and the difficulty is to find stock to satisfy the would-be purchasers.

British Electric Tractions have gained another point at 134½, on the strong hint provided at the meeting in regard to the possibility of a bonus. It seems likely that the ordinary stock will be converted into an 8 per cent. issue; after which, deferred stock will be given, to rank for profits over and above the 8 per cent. to which the existing ordinary and preference stocks will become entitled. Apparently it is the coal strike which has delayed the suggestion from being put into practical effect, but stockholders will doubtless be ready to possess their souls, and the stocks, in patience.

Mexican issues are again harder, the Tramway Company's bonds being substantially better, while Mexican Light & Power preferred put on a point. Brazilian Tractions have advanced to a trifle over par. Anglo-Argentine Second preferences are ¼ up at 2¾. The Barcelona Traction, Light & Power Company reports a remarkable increase in earnings, the balance available for dividends being 1¼ million dollars against a bagatelle of $75,000 in the previous twelve months. The company's preference shares are now receiving their full 5 per cent. dividend, and the common shares have risen to 30. Tokyo Electric Sixes at 93 are 1 up.

Metropolitan-Vickers ordinary have strengthened to 24s. 6d. The company has obtained an important contract from the Great Indian Peninsula Railway for work to be done on the main line electrification from Bombay to Poona. Forty-one electric locomotives, of a total value of over £650,000, have been ordered. Edison-Swans are a good market at 10s. 3d., showing a rise of a florin, and British Aluminiums gained half-a-crown at 2¾. British Insulated are 1/16 higher at 3 5/16. The wireless group is quiet, Marconis being 1/16 off at 1 3/16 and Canadians a little heavy at 4s. 3d.

The Telephone Manufacturing Company reports a loss for 1925 of £21,200, as against a loss of £46,200 for 1924. The Board has re-valued the company's assets, and thus obtained a surplus of £148,400 for the balance-sheet. By the aid of this, the debit balance on profit and loss account, and various other items, have been written off, leaving £23,274, now placed to special reserve. The company's business has improved, and the price of the ordinary shares advanced to 8s. Henley's fine report shows a profit of £311,000 for the year, compared with £361,400 for the previous 15 months. At 4, the price of the shares remains unchanged. Oriental Telephones keep at 43s. 9d.; the company's report announces that the sale of the China and Japan Telephone Company, a subsidiary of the Oriental Telephone, was satisfied partly in cash and partly in shares of the new concern, the Hongkong Telephone Company.

Calcutta Tramways at 18s. 9d. are unaffected by a reduction from 10 per cent. to 7 per cent., both tax-free, in the dividend. The revenue balance of £226,800 is about £11,000 less than that for 1924, and the directors have decided to conserve the company's resources owing to private omnibus competition and the commercial unrest that has lately occurred.

Engineering shares hold their values, but the iron and steel market is naturally dull, owing to the coal position. Rubber shares are a shade better, which is more than can be said for the amount of business doing in them.

We have frequently criticised the Electric Light & Power Contracts Finance Corporation and the Warwickshire and South Midland Electricity Supply Corporation. Both these companies were fined £20 and five guineas costs last week for having failed to file their annual summaries of account at Somerset House. Sir Charles B. H. Soame, Bart., and various directors were fined £20 each for permitting the default. Walter Thompson, solicitor, of West Hampstead, is a director of both concerns; he was required to pay only one fine. Lord Ilkeston, the stipendiary before whom the cases came, said it was very necessary that the provisions of the Act should be observed by those responsible for carrying on the business of public companies. The returns have been filed this month.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1924	Dividend. 1925.	Price June 14 1926.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14	14	57/6	+1/6	4 17 5
Brompton Ordinary	1	10	10	31/9	—	*6 6 1
Charing Cross Ordinary	1	15	15	45/9	—	6 10 10
do. do. 4½ Pref. ...	1	4½	4½	17/-	—	5 5 11
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	47/-	—	6 7 8
do. do. 6% Pref.	1	6	6	22/-	—	5 9 1
Clyde Valley	1	8	8	27/-	—	5 18 6
County of London	1	15		£8/3	—	5 12 8
do. do. 6 % Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	23/6	—	5 19 2
do. 7% Pref.	1		7	22/6	—	6 4 8
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	15	15	12⅝	+¾	5 9 1
Lancs. Light and Power	1	7½	7½	24/6	—	6 2 5
London Electric	1	10	10	32/6	—	6 3 1
do. do. 6% Pref.	5	6	6	5⅞	—	5 10 8
Metropolitan	1	11	11	37/-	—	5 18 11
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	21/-	+6d.	5 13 1
Newcastle-on-Tyne Ordinary ...	1	7	7	22/-	—	6 7 3
do. 5% Pref. ...	1	5	5	18/-	—	5 11 1
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.... ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	16¼	—	5 8 6
South London...	1	15	15	2½	—	6 0 0
South Metropolitan Pref.	1	7	7	26/3	+9d.	5 6 8
Urban Ordinary	1	4	7	1⅛	—	6 11 9
do. 6% Pref.	1	6	6	1	—	6 0 0
Westminster Ordinary	1	15	15	44.6	—	6 16 0
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	21/3	+9d.	7 8 0
Yorkshire Elec.	1	8	8	27/-	—	5 18 6

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	69	—	5 15 11
Metropolitan	,,	5	5	64½	−1	7 15 0
do. District	,,	3½	3½	£8	+½	6 12 1
Underground Electric Ordinary ...	10	Nil	Nil	4	+½	Nil
do. do. "A" ...	1/-	Nil	Nil	12/-	+1/6	Nil
do. do. Income ...	Bonds	6	6	101	+1	*5 18 :0

TELEGRAPHS AND TELEPHONES.

		Dividend. 1924	Dividend. 1925.			
Anglo-Am. Tel. Pref.	Stock	6	6	10¼	—	5 15 6
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	9½	—	4 0 0
Chili Telephone	5	6	5	6⅞	—	*3 12 9
Cuba Sub. Ord.	10	5	5	£½xd	—	7 8 2
Eastern Extension	10	10	10	18½	+½	*5 9 7
Eastern Tel. Ord.	Stock	10	10	181	+3½	*5 10 6
Globe Tel. and T. Ord.	10	10	10	18½	+½	*5 9 7
do. do. Pref.	10	6	6	11	+¼	5 9 1
Great Northern Tel....	10	22	20	28	—	7 2 10
Indo-European	25	8½	10	45½	—	*5 10 0
Marconi...	1	10	10	1⅞	−⅛	8 8 10
Marconi Marine	1	10	7½	21/3	—	7 1 2
Oriental Telephone Ord.	1	12	12	43/9	—	*5 9 7
United R. Plate Tel....	5	8	8	8xd	+3/9	*5 0 0
Western Telegraph	10	10	10	17½xd	+½	*5 14 3

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8¼	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	2¼	+⅛	10 8 8
do. do. 5% Deb. ...	Stock	5	5	71½	—	6 19 10
British Electric Traction Ord. ...	,,	7	8	134½	+1	5 18 11
do. do. 6% Pref. ...	,,	6	6	111	—	5 8 1
Brazil Traction	100	4	5	104½	+½	4 19 6
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	86½	—	5 17 0
do. do. Preferred ...	,,	96/-	126/9	103½xd	+2	*6 0 2
do. do. Deferred ...	,,	129/5	8	127xd	+3	*6 6 0
do. do. Deb. ...	,,	4½	4½	76	—	5 11 10
London & Sub. Trac. 5% Pref. ...	1	2½	Nil	6/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	49	—	8 3 4
Mexico Trams 6% Bonds	—	5	5	69½	+4	7 4 0
Mexican Light Common	100	Nil	Nil	33½	—	Nil
do. Pref.	100	Nil	Nil	74½	+1	Nil
do. 1st Bonds	—	5	5	71½	—	6 19 10
Yorkshire (West Riding)	1	5	—	14/-	—	7 2 10

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	13	52/-	—	*5 0 0
British Aluminium Ord.	1	5	10	2½	+⅛	4 8 11
British Elec. Transformer Pref. ...	1	Nil	7	18/9	—	7 9 4
British Insulated Ord.	1	15	15	3⅛	+⅛	4 10 9
Brush Ord.	1	10	10	37/-	—	7 5 6
Callenders	1	15	15	4½xd	+1/6	3 12 9
do. 6½% Pref....	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	18/-	—	... ...
Edison-Swan	£/-	10	10	10/3	+2/-	3 18 1
do. 5% Deb.	Stock	5	5	83½	+½	6 0 6
Electric Construction	1	10	10	33/6	—	6 3 0
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	Nil	16/3	—	... ...
do. do. Pref.	1	6	6	19/-	—	6 6 4
Gen. Elec. Pref.	1	6½	6½	24/6xd	—	5 15 7
,, Ord.	1	5	7½	30/3	+6d.	4 19 2
Henley	1	16	20	4	—	6 0 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber...	1	5	5	23/-	—	*4 6 11
Johnson & Phillips	1	10	17½	3½	—	5 15 8
Met.-Vickers Ord.	1	8	8	25/6	+6d.	6 5 6
do. Pref.	2	8	8	2½	+⅛	6 8 6
Siemens Ord.	1	7½	7½	28/9xd	—	5 4 4
Telegraph Construction	12	20	10	9⅜	+½	*4 5 8

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c.	Price June 15th.	Fortnight's inc. or dec.
a Acid, Oxalic ... ... per lb.	5¾d.	...
a Ammoniac, Sal ... ... per ton.	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Commercial ... ... ,,	£9 10s.	...
a ,, Roll ... ... ,,	£9 10s.	...
a Soda, Chlorate ... ... per lb.	3¼d. to 3½d.	...
a ,, Crystals ... ... per ton.	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots... ... ... per ton.	£120 to £125	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net.	£242	£2 inc.
Grade II ... ... ,, ,,	£169	£1 inc.
Grade III... ... ... ,, ,,	£93	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	9⅜d.	...
c ,, Tubes (solid drawn) ... ,,	11¾d. to 1/-	...
c ,, Wire, basis ... ... ,,	9¼d.	...
c Copper Tubes (solid drawn) ... ,,	1/0½	...
c ,, Bars (best selected) ... per ton.	£90	...
c ,, Sheet ... ... ,,	£90	...
c ,, Rod ... ... ,,	£90	...
d ,, (Electrolytic) Bars ... ,,	£65 10s.	20/- inc.
d ,, ,, Sheets ... ,,	£144 10s.	...
d ,, ,, Wire Rods ,,	£75 10s.	10/- inc.
d ,, ,, H.C. Wire per lb.	9¼d.	¼d. inc.
f Ebonite Rod ... ... ,,	2/3 to 2/6	...
f ,, Sheet ... ... ,,	2/3 to 2/6	...
n German Silver Wire ... ... ,,	2/2	...
h Gutta-percha, fine ... ... ,,	8/-	...
h India-rubber, Para fine ... ... ,,	1/6½	2d. dec.
l Iron Pig (Cleveland No. 3.) ... per ton.	72/6	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English pig ... ... ,,	£32	30/- inc.
g Mercury ... ... per bot.	£15 10s.	...
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/3	...
p ,, ,, rolled strip & sheet ,,	1/2½	...
p ,, ,, wire... ... ... ,,	1/3½	...
o Platinum ... ... per oz.	£23 10s.	...
d Silicium Bronze Wire ... ... per lb.	11½d.	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
n Tin, Block (English) ... ... per ton.	£266 15s. to £267 5s.	20/- to 50/- inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/1	4d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd,
r W. F. Dennis & Co.

A Long Transmission-Line Span.—What is claimed to be the longest span in an overhead transmission line is in course of erection across the Narrows of Puget Sound (United States). The channel is 4,800 ft. wide, flanked by cliffs about 300 ft. high. The sites for the towers are some distance from the water, making the total distance between them 6,240 ft. To comply with Government directions that the lines must have a minimum clearance of 200 ft. over the water the towers have been made 316 ft. high, and their elevated situation will permit of a maximum sag of 397 ft. The span will be in duplicate, necessitating a pair of towers on each bank of the Sound. The maximum computed reaction at the base of each tower is 310,000 lb. The line will be operated at 110,000 V.

Commodity or Privilege?—In some respects the business of electricity supply in the United States resembles our own practice very closely. In a recent address, reported in the *Electrical World*, Mr. J. C. Parker, vice-president of the Brooklyn Edison Co., said:—"A lay customer . . . who oughtn't to have to know anything about our miserable technique . . . just naturally can't come up to the counter and ask for 50 kWh to be wrapped up in a neat bundle and delivered to his house charged to his monthly account, but rather has to go through making an application in which he subscribes to a fine-print waiver of all his property, his rights as an American citizen and his hopes of everlasting salvation. He then runs the gamut of the credit department and the claim bureau and negotiates with his contractor and then gets a violation slapped on by the company or any one of a half a dozen official bodies, and in the course of time just before he is gathered to his fathers he has opportunity to make a limited and restricted use of the commodity in which we claim to be rendering public service."

The Incorporated Municipal Electrical Association.

Annual Convention at Glasgow.

THE I.M.E.A., with admirable courage—doubtless inspired by the Scottish resolution of its President, Mr. R. B. Mitchell—determined to hold its annual Convention, coal or no coal, and therefore assembled at Glasgow last Monday evening, to carry out at least the essential items of its programme, and as many of the social events as possible. Some curtailment of the programme was inevitable, but not so much as to detract seriously from the success of the meeting, though it could not be expected that so large a gathering would be recorded as in normal times. It will be remembered that in 1915, when Major H. Richardson, of Dundee, was president, no convention was held, and again in 1921, with Major Richardson a second time as president, the convention was cancelled on account of the coal stoppage; it is therefore a long time since the Association has met in Scotland, the last occasion being the Glasgow Convention of 1910, when Mr. W. W. Lackie was president. Those who were present on that occasion and partook of the lavish hospitality of the "Second City" would cordially endorse the decision of the Executive Council, and by the time these notes are read the many members who have now enjoyed the same experience for the first time will have realised that the Scot hides a warm heart under a sometimes rugged exterior.

Of Mr. R. B. Mitchell's career in electrical engineering we gave an account in our issue of July 3rd, 1925; a Glasgow man by birth and inclination, he has served the Corporation continuously for 28 years, becoming the head of his department six years ago—a record of which he may well be proud; carrying on the high traditions of his predecessors, he has maintained the efficiency of the Glasgow Electricity Department at the utmost pitch, and stands high in the esteem of the Corporation, as well as of his brother engineers. That he has left nothing undone to ensure the success of the Convention in spite of the difficulties of the time is certain, and in that aim he has had the hearty support of the staff of the Department.

Glasgow, as a great industrial centre, situated in a district rich in mineral wealth, and bestriding a river which for over a hundred years has been made navigable at great cost, has long possessed world-wide fame for its engineering works and achievements, and has been the home of many distinguished scientists, engineers, and administrators, the greatest of whom was Lord Kelvin. The population of the City is well over a million, and it covers 30,000 acres.

The government of Glasgow has been held up as an example of wise and prudent municipal administration for generations; the public services are admirably planned and efficiently conducted, and in every sense the city is up to date. Elsewhere in this issue we give an account of the Dalmarnock power station, designed by Mr. W. W. Lackie and extended by Mr. R. B. Mitchell; this plant is one of the most economical in the country, and has been visited by many engineers from overseas. The undertaking has over 61,000 consumers connected, to whom last year it sold 175 million kWh; it supplies power to 17,297 motors aggregating 140,000 h.p., and feeds over 4,000 street lamps. The total capital expended approaches nine millions sterling, but the net debt is only 5½ millions; the total revenue for the year 1924-25 was £1,242,118, and the average price received was 1.639d. per kWh sold. The Electricity Committee, of which Councillor Dr. D. McK. Dewar is Convener, has adopted a progressive policy, and is developing the domestic side of the business with assiduity; it has over 10,000 cookers, radiators and other apparatus out on hire, and supplies a total of 54,000 appliances of this class, having a total capacity of 72,150 kW. The Committee, under the advice of Mr. R. B. Mitchell, has instituted an assisted-wiring scheme, under which 2,000 houses have already been equipped.

Some 700 members and visitors attended the Convention on the first day, when fair weather prevailed. The organising work of the secretary, Miss Lanfear, and her staff was carried on under a heavy handicap, and they are entitled to the sympathy which the members have extended to them. Writing before the event, we believe the charming cruise in the Firth of Clyde which was planned for Wednesday afternoon, at the invitation of Messrs. Babcock & Wilcox, to follow the visit to that company's Renfrew works, will not take place—a sore disappointment to those who have enjoyed the trip on previous occasions, but unavoidable in view of the shortage of coal, and other obstacles.

The programme was opened on Monday with a reception by the President and Mrs. Mitchell, Dr. Dewar and Mrs. Dewar, followed by dancing and a display of kinema films on subjects of electrical interest arranged by E.D.A. On Tuesday the Convention was opened with a civic welcome by the Lord Provost, Sir Matthew W. Montgomery, after which Mr. Mitchell read his presidential address; the ladies then placed themselves in the care of Mrs. R. B. Mitchell, and visited the Electrical Exhibition, whilst Mr. S. E. Britton, M.I.E.E., read a paper on "Supplies to Outlying Districts." After the Corporation had entertained the visitors at luncheon, they were photographed in Linn Park, and proceeded to Dalmarnock power station. In the evening the Lord Provost and magistrates held a reception in the City Chambers, which was followed by dancing and a concert.

On Wednesday the works of Messrs. Babcock & Wilcox were visited, the party afterwards travelling to Gleneagles, where dinner was served, the return to Glasgow being by special train.

(To be continued.)

Presidential Address.

By R. B. MITCHELL (Engineer and Manager, Glasgow Corporation Electricity Department).—*Abstract.*

As one of the Council's representatives on the British delegation of the International Electrotechnical Commission, I attended the Conference in New York and subsequently joined in a tour to all the principal cities of the United States and Canada. It was good to see the enthusiasm and amity which prevailed at the Conference and satisfactory to learn that greater progress had been made towards unanimity at this year's meetings than ever before. Apart from the technical side of its work, this Commission is really and truly a League of Nations in the best sense; its work will do a very great deal to promote good feeling and to induce international friendship.

Density of Load in United States Towns.

The first impression made upon my mind by the skyscrapers of New York was one of envy. What a place in which to supply electricity! Beyond doubt, there is to be had there a greater consumption of electricity per square foot of area than in any other city in the world. In one part of the area one-quarter mile square, the density is estimated to be at the rate of 280,000 kW of actual load per square mile. Any electrical undertaking operating in such a city has every prospect of success.

Rural Supplies.

There is the other side of the picture when we survey the vast extent of rural areas where the population is very scanty, and possible consumers cannot average more than five to the mile. Nevertheless, supply is being given, although the load to be obtained cannot possibly be remunerative for a long time to come.

In general, the rates of charge for rural supply are the same as for the metropolitan areas. It is recognised that the bad must be taken along with the good, and this is a problem which we, in this country, are to be faced with very soon if the ideals formulated in the Weir Report are ever to come to fruition.

It must not be forgotten, however, that the main justification for interconnection is the mutual benefit to be derived by developed areas by this interconnection. The supplies given to the rural areas on the route of the transmission lines are merely incidental, but are certainly of great benefit to those areas when once established.

New York Edison Company—Distribution.

The New York Edison Company is maintaining perhaps the most expensive system of distribution existing at the present time, and one which we, in this country, are trying to break away from. The supply is direct current at the low pressure of 120 volts. All cables are laid in ducts, and batteries, installed in sub-stations, are floating continuously on the network, to come into action in the event of a breakdown of the generating plant. Justification is claimed for this large expenditure because of the special conditions which exist, and particularly the installation of storage batteries is justified because of the serious consequences which might result from a failure of supply in that very congested area.

Power Stations.

In inspecting power stations in America, one is impressed by the size of the generating sets. I visited ten stations belonging to public utility undertakings, and I did not see any sets in use of less than 15,000 kW, and these formed a very small proportion. For the most part, capacities were of 35,000 kW and upwards, and it is the intention in one plant to install, at an early date, a unit of 100,000 kW. We are not in a position at the present time to follow that example. When interconnection becomes more general and extends over wide areas, the position may be very different.

Apart from the size of the turbo-alternators, which is the main feature of the power plants in America, one very important development is taking place there—the introduction of the high-pressure turbo-alternator, taking steam from a separate boiler at about 1,200 lb. pressure, and exhausting into the main steam range at the pressure of the main boilers. One plant of this description was seen at Weymouth station, in Boston, in operation, and another in course of construction at Milwaukee. This development may prove a means of making our moderately-efficient stations still more efficient without heavy capital expenditure, and without much scrapping of what may be still good and useful plant. It is estimated that, under good conditions, a saving of 7 per cent. can be obtained by the superposing of this high-pressure set on the ordinary sets in a power station.

Particular note was taken of the plants which were operating with pulverised fuel. Considerable experience has now been had in America with this form of firing, and comparisons have been made with equivalent stoker firing. In all cases under our review, complete satisfaction was expressed with pulverised-fuel firing, and I think there can be no doubt that, as larger and larger boilers are demanded, we on this side shall be driven to adopt this equipment. Large-capacity boilers need large stokers. The larger the stoker, the weaker it is in proportion and the more complicated. It is at this point that pulverised fuel becomes worthy of serious consideration. In the building of stokers a high degree of perfection has been attained. One travelling-grate stoker, 40 ft. wide, was seen in operation in one of the stations visited.

Attention should be called to the extent to which automatic boiler control has been developed in the States. In all large boiler rooms we find these equipments working with satisfaction to the users. I have no doubt that, at an early date, this matter will receive the attention here which it undoubtedly deserves.

A stigma which has been attached to the generation of electricity from coal during the whole period of public supply, in that the burning of crude coal was wasteful and wrong, has now good prospects of being removed. In Milwaukee, at Lakeside power station, I saw, completed, an installation for the treatment of coal in the pulverised form which, if expectations are realised, will enable valuable by-products to be extracted, before the residual, in the form of pulverised coke, is sent to the boilers. A saving in fuel costs calculated at 50 per cent. is expected to be the outcome, and if this be the happy result, a reproach long levelled at us by our gas friends will no longer be justified.

As regards the cost of power stations in the United States, the figure of £25 per kilowatt installed is considered nowadays to be quite moderate. In this country it would be deemed to be very much too high.

Cost of Electricity.

With regard to the rates at which electricity is sold in New York and other large U.S. cities generally, our own rates of charge compare very favourably with these, and in many of our undertakings they are much lower. The impression undoubtedly exists in this country that we are much behind in this respect, and it is time that an emphatic contradiction was tabled.

Supply engineers over there venture the opinion that the rates in this country are unnecessarily low, and point to their own extraordinary development as proof of the correctness of that statement. I do not agree with this opinion. Rates of charge, in municipal as well as company undertakings, should be as low as possible consistent with sound finance, if our consumers are to be able to make full use of what electricity can do for them. In America the ordinary consumer, although quite well-to-do, uses electricity for lighting, and there may be an iron and a vacuum sweeper in his household; but the rates do not permit the use of electricity for much else, and a 3-unit fire would be quite out of the question.

Development.

In spite of these charges, the rapid rate of the development of electricity supply is really astonishing. This fact has often been referred to in the past, and comparisons have been drawn with a view to emphasising our own backwardness.

The latest figure available makes the comparison even worse, namely, that of the record of the Commonwealth Edison Company of Chicago, as published in its last report. The units used per head of the population for the year in question amounted to 1,030, a figure, I believe, excelled only in one other undertaking, also in America.

This rapid development is, of course, due to America being a comparatively new country with any quantity of land ready for occupation, and also to the fact that it is passing through a time of great prosperity.

In Chicago last year lighting and small power was 26 per cent., railway light and power, 30.1 per cent., while power used in industry was 38.6 per cent. of the total, with 5.3 per cent. sold to other undertakings. In 1907 more than half (55 per cent.) of the total output of this company was for railway use, and lighting and small power amounted to 43 per cent. of the total.

These figures are interesting and show the extent to which the electrification of railways has proceeded in America. Approximately one-third of the output of this very large undertaking is used for railways. We have nothing to compare with this in our country. We all look forward to the day when the percentage of output for railway use, not from one of our undertakings only, but for the whole country, will approach the figure I have given above. These figures bring out another interesting point, *viz.*, that if the output for railway use is deducted, the units-used-*per-capita* figure becomes about 700. As the overall figure for this country is about 200, we still show up very badly in comparison.

Showrooms.

The showrooms of the electricity supply undertakings of the United States are an object-lesson to us in this country. Everything is done on what would be considered here a very lavish scale. An amount of space which we would consider excessive is allocated to showrooms, although it would seem that only the domestic side is catered for. No simple hiring of appliances is undertaken, but almost every sale is made on a deferred payment system. In one undertaking, the showroom sales amount to £1,000,000 per annum, and about 90 per cent. of this sum is received in instalments. In Chicago 48,000 irons were sold in one year, and in the same period five and a quarter million lamps were given out on the free-replacement system. Anything can be obtained on deferred-payment terms, from a house to a motor-car, and there is no doubt that business is stimulated thereby. We would do well to copy, to some extent at least, this example set by our American friends.

Domestic Load.

As with us, the importance of the domestic load has been recognised by supply authorities, and despite the high rates in force, great efforts are being made in many undertakings to induce domestic consumers to use electricity for purposes other than lighting. The re-laying of distribution mains in residential areas is faced quite cheerfully, the increased returns being confidently expected to make the expenditure well worth while. This may be a lesson to some of our own members who have hesitated to encourage, or have even discouraged, the use of appliances for purposes other than lighting by their domestic consumers.

Refrigerators.

In every showroom visited, the domestic refrigerator was found very much in evidence, and its sale being pushed energetically. This appliance is receiving at the present time, from sales managers in the States, more attention than any other. It has arrived now at a state of perfection which makes it a very reliable and very desirable part of every kitchen equipment. I am not prepared to say that in our climate it is so essential in the household as it is under American conditions, but there is a large field for it in hotels, restaurants, &c., and that field ought to be explored by everyone interested without delay.

Service.

The motto "Service to the Consumer and Prospective Consumer" has been adopted in all earnestness by the public supply undertakings in the United States. A telephone system dealing with "service" only is worked at the highest efficiency. Prompt attention is given to all complaints, broken-down appliances are repaired in the shortest possible time, and every care is taken to ensure that there is not one dissatisfied consumer. Research departments are maintained, and these are regularly called into assist in solving some problem which may have arisen on the selling side, involving the use of the company's supply. We would do well to follow this very good example.

Electric Vehicles.

The electric vehicle is making headway. I found that in New York city there are now some 4,000 vehicles working regularly, and their number is steadily increasing. One large biscuit factory has one hundred 5-ton wagons in use on its transport services. The agreement with the supply company

restricts the supply of energy for battery-charging purposes to the night hours.

The development of this business means not only increased consumption, but load-factor improvement.

To sum up, one can only conclude from these observations that in the United States they, in many respects but not all, are well ahead of us in things electrical. They are thoroughly converted to the super-power idea; they believe in big plants and in interconnection over wide areas; they are going for maximum reliability and efficiency, the former always being placed first. The men at the head of affairs are very proud of what has been achieved and of the people who have helped to bring about the present state of development.

Electricity Supply to Outlying Districts.

By S. E. BRITTON.—*Abstract.*

The paper deals with the supply of electricity by authorised undertakers to districts which are adjacent to, or within the economic limits of, secondary transmission and low-voltage distribution from their own stations, but are at present not served with electricity.

Fig. 1.—Generating Station Sites and Coalfields.

One of the reasons for the present unsatisfactory progress is that there are now available sufficient cases of inconsistency in the administration of the Electricity (Supply) Acts to justify the mistrust and uncertainty prevalent throughout the industry.

The methods of constituting Joint Electricity Authorities and of dealing with applications for Special Orders under the 1919 Act have been most effective in encouraging super-parochialism. The effect of collecting together hundreds of people from a district thousands of square miles in area, the majority of whom have no knowledge of how electricity is generated and supplied, representative of all the various forms of local government, and asking such an ill-assorted band to consider schemes for affording a supply over a large area, cannot be expected to lead to a satisfactory result. One of the fundamental provisions of the 1919 Act, therefore, instead of checking parochialism, is responsible for the continuance of a condition which it is vitally important to remove.

The registrar-general's Statistical Review of England and Wales for the year 1924 contains a record of deaths from various causes, including the following:—

Cause.	1919.	1920.	1921.	1922.	1923.	1924.	Total.
Accidental burns ...	2,095	1,785	1,588	1,722	1,608	1,565	10,363
Machinery	326	329	180	192	213	229	1,488
Vehicles, Railways, &c.	3,730	3,826	3,496	3,485	3,751	4,436	22,724
Injury by animals ...	111	69	84	63	63	66	456
Lightning	5	11	3	4	8	12	43
Electricity	32	26	19	21	25	37	160

which figures emphasise the fact that electricity is not necessarily as dangerous as the severity of the regulations issued by the Electricity Commissioners and the Postmaster-General would lead the public to imagine. The inconsistencies in the relationships of the electricity supply with telephone and telegraph services, together with the rules for obtaining wayleaves, are amazing. It is incredible that matters have not been improved before attempting to formulate the Electricity (Supply) Bill, 1926. It is abundantly clear that the industry cannot be efficiently carried on when such details as lopping trees and wayleaves have to be referred to the Electricity Commissioners and the Minister of Transport in London. Given suitable legislation, these matters at once become matters of routine and local interest only; they can, therefore, be settled in a more satisfactory manner and by less costly public officials than those now entrusted with them. It is suggested that the land agent of county council estate departments might be appointed to settle such matters on the spot on payment of a standard fee, plus out-of-pocket expenses; the procedure might be somewhat similar to that adopted in appointing an electrical inspector under the Electric Lighting Clauses Act, 1899.

While parochialism is not a charge usually levied against private enterprise, or power companies, with a few exceptions their attitude towards the development of their areas has been narrow-minded; they have confined their attention to the most thickly populated and industrialised parts in much the same way as local authorities have done. The country cannot afford to allow the development of a scheme to be sport for politicians, or men of intriguing propensities, neither are the decisions of the Electricity Commissioners and the Minister of Transport in respect of applications for Special Orders for distribution powers always free from the reproach of parochialism.

The decisions regarding the district of which Chester forms the centre justify the opinion that London is not a suitable place from which to arrive at a correct and final judgment on the technical, administrative, and economical merits of proposals for the development of the supply of electricity in rural areas. An instance of how *not* to proceed has recently been provided by the Wirral Rural District Council, which attempted to develop a distribution scheme in its area. The Electricity Commissioners approved of Wirral's application for a Special Order, and eventually a scheme was formulated and application was made to the Commissioners for sanction to borrow £180,000 to enable it to be carried out. At the public inquiry into the application it was stated that agreements for bulk supplies of electricity had been prepared between the Rural District Council and the Mersey Power Co. and the Wallasey Corporation respectively, based on a kilowatt charge and a price per unit, with a minimum payment per annum irrespective of the quantity of electricity taken, thus safeguarding both the Company and the Corporation against loss in giving a bulk supply. The estimates of income and expenditure for operating the undertaking during the initial stage showed a loss of about £9,000, if the maximum price allowed by the Special Order was charged, whereas figs. 2 and 3 indicate that the area of the Wirral Rural District Council could be more economically supplied by ignoring the District Council's boundaries and attaching it to the area of one, or more, of the adjoining authorised undertakers.

Approximate Area which existing Authorised Undertakings could supply with Secondary Transmission at 6,600 volts
Approximate Area which existing Authorised Undertakings could supply with Secondary Transmission at 11,000 volts

Figs. 2 and 3.—Existing Areas Authorised Undertakings could supply with Secondary Transmission (left) at 6,600 V and (right) at 11,000 V.

If it is admitted that large quantities of cheap electricity can be generated in this country only where there is abundant natural water for condensing purposes in close proximity to

the coalfields, then such localities are limited to a few districts. A national scheme therefore resolves itself into: (*a*) Generation in comparatively few localities; (*b*) a comprehensive system of transmission; and (*c*) extensive areas of distribution.

Fig. 1 shows lengths of rivers which have at least 800 square miles of catchment area and estuaries that have water available for generating stations with a plant capacity of 100,000 kW and upwards, the coalfields, the selected stations referred to on pages 26, 27, 28, 29, and 30 of the Weir Report, and other authorised undertakings. This map indicates the proximity of the "selected" stations to natural water and the coalfields and the extent to which the undertakings are distributed over the country; also how illogical it is to constitute Joint Electricity Authorities to generate electricity in the districts which have so far been delimited, and emphasises the necessity of generating stations being erected with a view to meeting the requirements of the country as a whole.

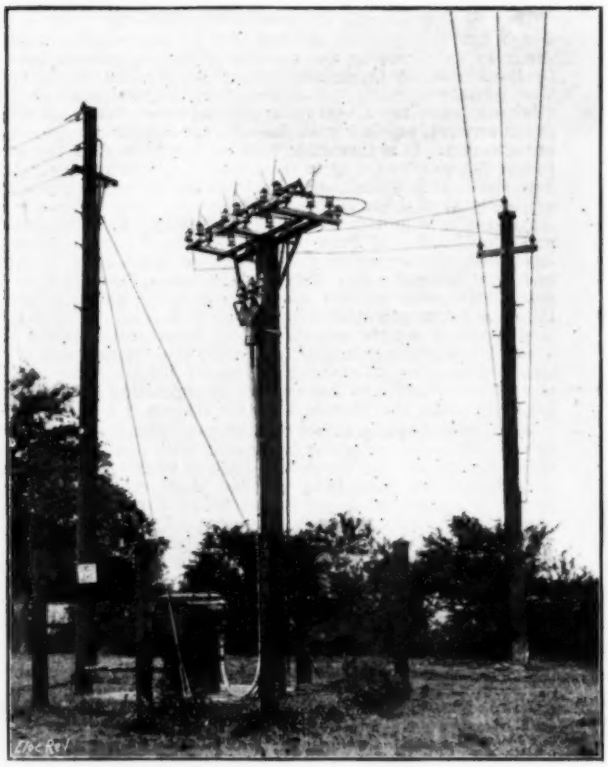


Fig. 4.—A 6,600/400-V Transformer Sub-station, Controlled by 6,600-V Outdoor Switchgear.

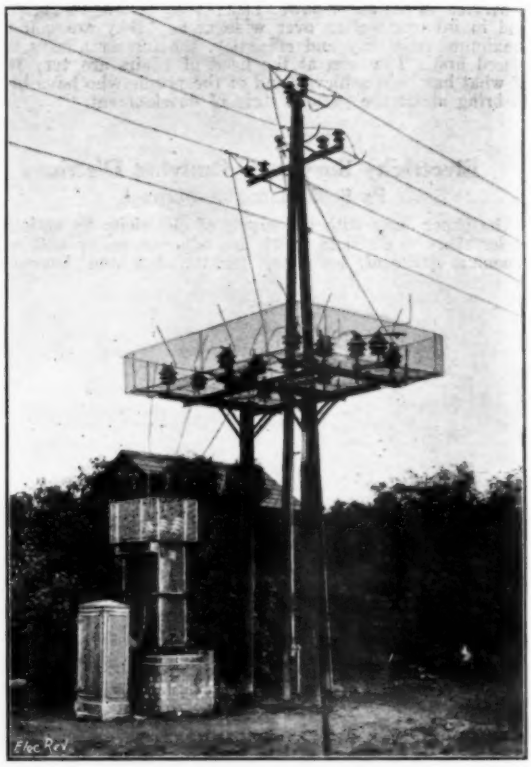


Fig. 6.—A 33,000/460-V Transformer Sub-station, Controlled by 33,000-V Outdoor Switchgear.

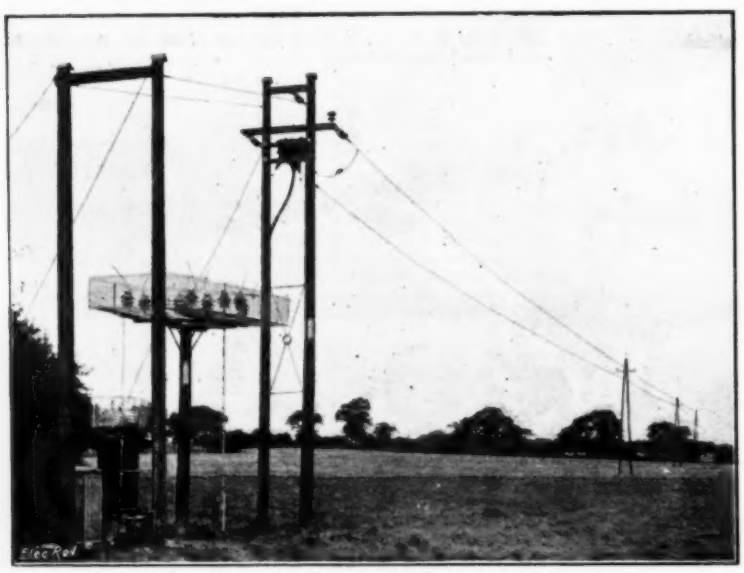


Fig. 5.—Outdoor 33,000/460-V Sub-station.

Figs. 2 and 3 show the positions of all authorised undertakers, except the smallest, and the areas they would cover if their systems of distribution were extended to the limits of transmission at 6,600 and 11,000 volts respectively, as well as the effect of covering the whole of the country with distributors of electricity. They indicate the necessity for withholding, for a specified time, the grant of Special Orders to those who are not already authorised undertakers so as to enable existing undertakers to investigate the potentialities of the areas which lie within the economic limits of 6,600 and 11,000 volts respectively from their stations. This would be better than adopting the proposals contained in paragraphs 70 to 78 of the Weir Report. (*To be concluded.*)

The I.M.E.A. Exhibition.

IN connection with the Convention an exhibition of electrical apparatus is being held at the McLellan Galleries, Sauchiehall Street, where floor space of about 10,000 square feet is being utilised by some twenty-four manufacturers, the Electricity Department of the Corporation of Glasgow, the E.L.M.A. Lighting Service Bureau, the British Electrical Development Association, and the Electrical Association for Women. The displays cover the whole range of modern lighting, heating, cooking and labour-saving appliances, electro-medical applications, water heating and refrigeration. In addition, a number of special exhibits of interest

Fig. 1.—A Modern Electric Cooker.

to engineers include thermostats, meters of special types, heat-storage apparatus, industrial heating appliances, and new wiring methods. The exhibition is open to members of the Convention and to the general public at specified times.

The General Electric Co., Ltd., is exhibiting a wide range of its products, including "Magnet" electric cooking apparatus, and electric suction cleaners, the latter being manufactured throughout in Great Britain and sold exclusively through the electrical trade. The running cost of the cleaner is approximately one half-penny per hour. Fig. 1 shows the maker's H.7500 model electric cooker. A full range of "Gecoray" shop-window lighting reflectors, various lighting units, "Freezor" electric fans, and numerous types of "Osram" lamps are among the other exhibits. Owing to the limited amount of space available on the stand at the Convention, a special display is also being made of the Company's products at its Glasgow showrooms, where demonstrations, "Doing it Electrically," are being featured throughout the period of the Convention.

A representative selection of the various models of "Creda" electric cookers is to be seen on the stand of Credenda Conduits Co., Ltd. This includes five models from a size convenient for two up to a large cooker suitable for 18 persons. The special feature of these cookers is the embodiment of "plug-in" elements. Considerable interest is being shown in the new "Globar"-pattern elements for boiling plates and grills. In these a new resistance material, "Globar" (ELECTRICAL REVIEW, May 7th, p. 761), is employed, which marks a departure from the usual nichrome alloy. The advantages claimed for the "Globar" rods are that they are unaffected by any liquids being spilt on them, and even a piece of wire laid across two of the rods, causing a dead short, will do no harm beyond blowing the fuses. A very long life is claimed for the material, and it has the further advantage that a very high loading can be obtained, as much as 3,000 watts being possible on a standard 7 in. by 7 in. hot plate. "Globar" elements can be fitted as an alternative to the firm's standard element at a slight extra cost. The other exhibits of this company include a new series of electric kettles, having automatic protective devices, and a very neat wash boiler. A few electric fires embodying the "Crater" fire bars are also on view.

The Siemens & English Electric Lamp Co., Ltd., is exhibiting a selection of "Siemens-Xcel" electric domestic appliances, including electric irons, kettles, fires and electric cookers. The fires comprise various types of well fires and those of the imitation-coal type. The cookers, which have been designed with a view to efficiency in use combined with simplicity in operation, have boiling plates of special patented design, circular, 7 in. diameter, so arranged that the utensils are in close proximity to the spirals. These are supported in grooves and arranged so that on medium heat the centre spiral only is in circuit, giving practically the equivalent of full heat for a small pan with only half loading, and avoiding the wastage of heat from uncovered spirals. A feature is the ease with which the elements may be replaced. Plug-in terminals are adopted for both the boiling plates and the grills. The grill, which is fitted with 3-heat control, is provided with a damper plate, which, when removed, exposes a circular portion of the grill element, and renders the unit suitable for boiling purposes. The hobplate is hinged. The oven elements are arranged on busbars, and are easily removed by slackening two screws. The "Xcel" No. 1 iron is made in various weights and is fitted with a patented side-entrance connector which keeps the flex away from the user's arm and obviates one of the common troubles with irons, *viz.*, the failure of the lead caused by the continual pulling out of the connector by means of the wire. A thumb grip is provided, which must be used to remove the connector, and a special steel bell-mouthed entry prevents wear on the flex.

A very attractive stand is that of the British Thomson-Houston Co., Ltd. An important feature of the exhibit is the "No-Lag" induction motor, which is being shown for the first time. This machine (ELECTRICAL REVIEW, February 12th, 1926, p. 271), in addition to possessing all the advantages of an ordinary induction motor, operates at practically unity power

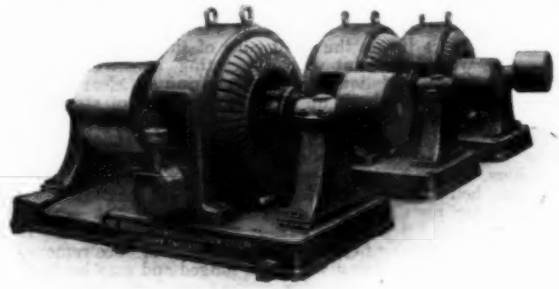


Fig. 2.—B.T.-H. "No-Lag" Induction Motors.

factor over the entire load range. The "No-Lag" motor can be supplied to give a leading power factor of 90 per cent. at full load, thereby improving the power factor of the system when working with other motors of the ordinary induction type. At the same time, it is claimed, the "No-Lag" motor will take its full rated load. Fig. 2 shows a group of "No-Lag" induction motors, each rated at 250 h.p., 600 r.p.m., 433 V, 3-phase, 50 cycles.

An exhibit of motor-control gear representing recent advances in this direction is of particular interest. For d.c. work a very compact unit, comprising a face-plate type starter, fuses, line switch and protective devices, all completely enclosed in an iron case, designed to meet the requirements of motors up to about 18 h.p., is among this equipment, which may be obtained for wall or pillar mounting. An a.c. motor-control pillar has a starting switch of the drum type, built on the lines of the B.T.-H. controllers for crane duties; it has a slow motion, or step by step, starting mechanism with the dead-man's-handle feature. Interlocks are provided to guard against any contingency, and full protective equipment is fitted. Provision is made for routine inspection and testing in a quick, clean and effective manner, all parts being easily accessible for this purpose. Examples of the B.T.-H. fractional horse-power motors are being shown, and also "Tungar" battery chargers for both high- and low-pressure charging. One of the most attractive features of the stand is a wonderful display of "Mazda" lamps, lighting fittings and reflectors. The lighting equipment is ingeniously arranged, and provides effects which are at once striking and artistic. One fascinating item in the lighting section shows some of the possibilities of coloured lighting for shop-window displays. A novel method of presenting a record in an attractive manner of some of this company's products is the use on the stand of illuminated stereoscopic views in colour of a number of important installations of various kinds.

Some models of electric cookers built on the lines of the one described in his paper on "An All-Electric House," read before the Institution of Electrical Engineers by Dr. S. Parker Smith (ELECTRICAL REVIEW, December 11th, 1925, p. 951), are among some of the most interesting exhibits. These were built

Fig. 3.—Cooker with Plug-in Utensils.

for Dr. P. Smith by Messrs. Archibald Low & Sons, Ltd. A table model boiling plate is of special interest. For use with this apparatus are three pots—of a substantial type—of 3-, 6- and 9-pint capacity, each fitted with heating elements and arranged for three-heat control. At the back of the bench sockets are fitted to accommodate the three-pin plugs of the utensils; no flexibles are used, the sockets being given a certain freedom of movement in their mountings. It is claimed that the consumption and cost of cooking have been reduced to less than one-half by replacing the two original open boiling plates with utensils having their own heating elements. Most of this saving is due to the high overall efficiency of electrical appliances with self-contained elements, and the rapidity with which the maximum efficiency is attained after switching on, thus rendering such vessels eminently suitable for the short operations which are characteristic of household practice. The model also contains a 3-heat control grill and an enclosed-type boiling plate. The latter is intended for use with utensils for occasional duty. Fig. 3 shows one of the models which is attracting considerable interest. It is of the usual design of domestic cooker, incorporating the self-contained-element utensils and the plug-in principle for the boiling arrangements. The cost of this cooker exceeds that of the ordinary apparatus by the value of the utensils, but it is claimed that the extra charge will be quickly covered by the saving in consumption.

An interesting display of electric water-heating equipment is to be seen on the stand of Messrs. BENHAM & SONS, LTD. Several types of electro-vapour radiators and towel rails are being shown, including, of the former, a specially-designed apparatus for use on board ship. A 4-gallon aluminium-lined urn is shown complete with a neat switchboard and the necessary connecting leads. An electro-vapour coil is included

in the exhibits. It is designed for the heating of inaccessible places such as linen cupboards, drying rooms, and garages. This apparatus is made in capacities of 200 W upwards. Other interesting items are electric geysers, fig. 4; these are of the electro-vapour type, and each consists of a

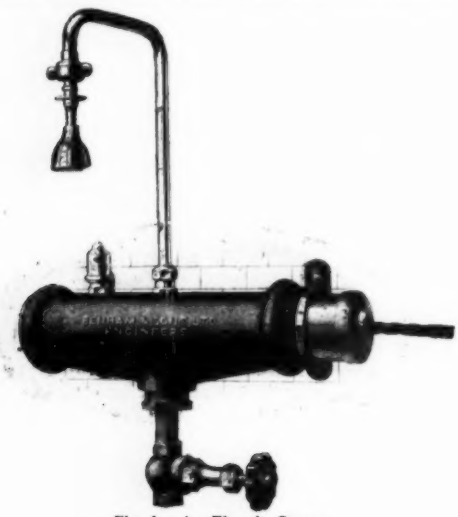


Fig. 4.—An Electric Geyser.

chamber into which one or more "Benham" immersion elements are screwed. Two models shown are of 900- and 2,000-W capacities and are fitted with 1- and 3-heat elements respectively. Other exhibits include a 20-gallon galvanised electric water-heating cylinder and an electric toaster, 12 in. by 12 in.

One of the items included in the display of Messrs. Carron Company is the firm's No. 616 electrically-heated wash boiler, fig. 5. This has a cast-iron pan with a well as the lowest part, over which is fitted a perforated guard of galvanised sheet steel. The cast-iron legs are connected with a triangular jointing piece. A large-bore draw-off tap is fitted to the pan, and an auxiliary tap is fitted to the base. The boiler is heated by means of two 2-kW immersion heaters fitted in the well. Two "Carron" electric cookers are also being shown, models 310 and 311. Fig. 6 is one of a variety of electric fires which are on view at this stand. This model, 23a, is fitted with a fireclay element which is interchangeable with the firm's patent cast-iron enamelled element. It is 12 in. wide by 19 in. high, and weighs 27 lb. The loading is 1 kW. Other articles shown here include a selection of electric irons, kettles, grills, and boiling plates.

Fig. 5.—Electric Wash-boiler.

Fig. 6.—An Electric Fire.

Messrs. Belling & Co. are making a special display of their No. 6 cookers. These have been designed specially for hiring-out purposes, and whilst the general design and constructional details are uniform throughout, three different types of heating elements are used in various combinations. The most interesting of these elements is one of entirely new design; this is of the closed type with a cast-iron top, and it is claimed to be impossible for spilt liquids to come into contact with the spiral. The design of the protecting plate enables a pint of water to be boiled from cold in 8 min. with a loading of 1,200 W. Another of the elements is of the open type, while a third incorporates the solid fireclay principle.

Two stands at the exhibition are occupied by the British Electric Transformer Co., Ltd. One of these is devoted to selections of the latest "Tricity" sun-ray radiators, which are shown in something approaching a home setting, though the space available does not permit of anything like full-size rooms. On the other stand various types of cooking apparatus are shown and cooking demonstrations given. A section is set apart for general domestic electrical apparatus, including fires, toasters, irons, and kettles. The fires include models fitted with a new alternative element, in addition to the well-known "Flame" element fires. The new element is fitted with a steatite base and has spiral coils.

Messrs. D. B. Selkirk & Co. are displaying some interesting ultra-violet apparatus, including their artificial "mountain sun" mercury-vapour lamp, some vacuum and atmospheric types of burners, and various models of arc lamps with special tungsten-cored carbons. Radiant-heat apparatus for covering the whole of the body or for local application is also being shown, and also diathermy apparatus for cauterising malignant tumours and treating certain diseases, and high-frequency equipment for the treatment of nervous disorders.

Messrs. J. H. Tucker & Co., Ltd., are devoting the space allocated to them to the demonstration of the efficiency of their new B.4,000-type 5- and 15-A switches (Electrical Review, March 26th, 1926, p. 517). One switch of each capacity is controlling a load consisting of electric fires on 250 V d.c. The 15-A switch is acting as a main switch and controls two 3.3/4-kW fires, one of which is governed by the 5-A switch. The demonstration shows conclusively the exceptional high efficiency of the switches, which renders them most suitable for heating and gasfilled lamp loads.

An interesting selection of heating equipment may be seen on the stand of Messrs. Young, Osmond & Young, Ltd. This includes a standard skirting heater for use with the makers' electric tubular heating system. The heaters are placed horizontally on the skirting boards so as to obtain the maximum number of heat units per sq. ft. for a given surface temperature. The device is constructed with a coiled heating element passed in a hairpin bend through two porcelain tubes. The complete element is inserted in a steel tube provided with a cap at one end and a terminal cover at the other. Wall- and floor-type towel rails are also shown. With the latter no flexible wiring attachment or wall plug is necessary, a terminal being contained in the base with a length of conduit leading to it. A feature of the stand is a water-tight and gas-tight tubular heater designed for use where liquids or inflammable gases are present. Window heaters, for the prevention of water condensation on shop windows, and car-bonnet and garage heaters are also included in the exhibit.

Some interesting models of "Burco" electric wash boilers are displayed by Messrs. Burnley Components, Ltd. The No. 60A model has a loose lid which fits into a recess in a top rim of galvanised iron. The addition of three lugs soldered to the inside of the pan and supporting a cage or perforated container, enables this apparatus to be used for steaming vegetables or boiling puddings, &c. This boiler has a capacity of 10 gallons and a loading of 3-3½ kW. An all-copper model is also on view; the casing is of polished copper treated with a special transparent lacquer to withstand the action of water. This type of boiler is made with loadings of from 3- to 5-kW. A combination electric boiler shown is designed for boiling milk, porridge and other liquid foods, as well as for use as an ordinary wash boiler. The apparatus consists of one pan fitted inside another, the inner pan being made from hard rolled copper, tinned inside and out, and fitted with handles for lifting-out purposes. Milk is placed in the inner pan and water is poured into the outer pan by means of a funnel which is fixed on the side of the body. When the inner pan is removed, the boiler is ready for use as an ordinary wash boiler.

A range of modern domestic cookers is also being shown and operated on the stand of the Cable Accessories Co., Ltd. An all-enamelled oven is attracting a good deal of interest. It is constructed of welded-steel sections, vitreous enamelled on both sides. The lower corners at the sides and back are rounded and a lip on the front edge of the floor projects and forms a weathered joint with the casting, effectively preventing the ingress of liquids during cooking or cleaning. The oven elements are built up of refractory bars of steatite and are hung on the oven walls. A large hot cupboard is fitted with a drop door forming a shelf when open. Standard "Revotherm" semi-enclosed boiling plates are fitted on all the cookers. A new plate incorporating the "Globar" element is also being prominently shown and demonstrated. The hinged top plate is a feature of the cookers. A novel and extremely useful pot-rack is also proving of interest. It is instantly adjustable to any of six heights or at once removable. The rack and pillars as a whole are hinged and may be dropped down on to the top casting for packing or when raising the top for inspection. All the wiring is carried out in solid copper strip and all the connections to the elements are made by a standard-size nut. A selection of fires is being shown, each incorporating the "Emitter" fire bar. This is built on the parabolical-refractory-reflector system. Plug-in contacts are provided, facilitating rapid interchangeability of bars. A display of electric irons in all sizes from a 20-lb. laundry model to a small traveller's iron is also being shown.

(To be concluded.)

The Binary Converter.

A New Type of A.C.-D.C. Converter.

THE chief characteristic of the usual types of converting apparatus is that the direct-current voltage regulation depends either on the use of transformers or of two distinct machines, such as the motor-generator set. It seems, therefore that converting apparatus consisting of one machine only, capable of being arranged to be fed with alternating current of any voltage (including a high-pressure supply) without the use of transformers and, at the same time, of delivering direct current of any voltage independently of that of the alternating current, should find a wide field of application; and its value is still further enhanced by the possibility of arranging the d.c. side so as to have any desired characteristic, series, shunt, or compound, or even such special characteristics as are required for welding purposes. The type of machine described below (fig. 1) has been designed to satisfy these requirements, and is believed to possess marked advantages over every other.

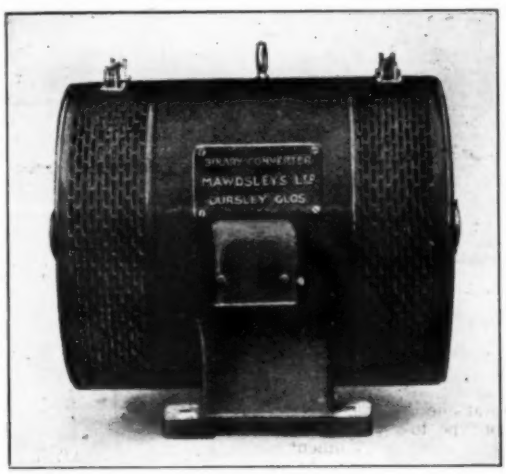


Fig. 1.—The Binary Converter.

The sectional elevation of the binary converter (fig. 3) shows that it consists of a laminated stator similar to that of an induction motor and mounted in the same way inside a cast-iron frame. The stator contains a standard induction-motor winding in the space next to the air gap, and a field winding in the same slots, but completely insulated from the alternating-current winding, there being no electrical connection whatever between them. Inside the stator a rotor carries a direct-current winding attached to a commutator; this winding is exactly the same in nearly all respects as that of a standard d.c. machine, but contains special circuits adapted to carry the secondary current of the induction-motor end; it is fitted with standard brush gear.

The binary converter may be either of the synchronous or induction type; considering the former pattern first, suppose a machine carries four windings, two on the stator and two on the rotor (*a*, *b*, *c*, d, fig. 2) and that of the rotor windings *c* is arranged for six poles and *d* is a two-pole winding; also that of the two stator windings *b* is arranged for two poles and *a* is a six-pole field winding. Suppose d.c. to circulate in the two-pole field winding *d* on the rotor and the machine to be running at the synchronous speed of this two-pole winding (namely, 3,000 r.p.m. at 50 cycles), then clearly the two-pole winding can induce no voltage in the rotor winding *c*, since it revolves with it and hence does not cut it; similarly, if d.c. circulates in the field winding *a* on the stator, it can induce no e.m.f. in the other winding *b* on the same core, since both windings are fixed. Winding *a* induces e.m.f.'s only in *c*, and *d* induces e.m.f.'s only in *b*; the flux due to winding *d* (stationary with respect to the rotor) will revolve in respect of the stator, while that due to winding *a* will revolve with respect to the rotor and is stationary with respect to the stator.

If winding *b* is supplied with 50-cycle single-phase or poly-phase current, the machine will run as a synchronous motor and, if winding *c* is joined to a commutator, a direct-current e.m.f. will be produced across that commutator. Winding *d* cannot induce any e.m.f.'s in *a*, since the two are wound for dissimilar numbers of poles; for the same reason winding *c* cannot induce any e.m.f.'s in *d*.

In practice the use of two windings on the rotor of such a machine is inconvenient, and is rendered unnecessary if the single rotor winding attached to the commutator is given a pitch which is equally adapted to operate with six or two poles, such, for instance, as the full two-pole pitch which is also equally well suited to six poles. If this winding is tapped at points differing by two pole pitches of the six-pole field (that is, at three points 120 deg. apart) and the points brought out, say, to slip rings, no e.m.f.'s will be induced

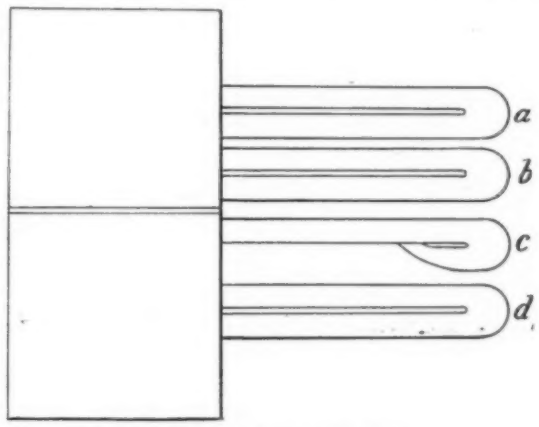


Fig. 2.—Arrangement of Windings.

by the six-pole flux between any two slip rings. If, therefore, a pair of them are short-circuited and direct current inserted between the short-circuited pair and the remaining ring, two-pole excitation of the rotor may be brought about without requiring the use of a separate winding. In this way the six-pole and two-pole windings may be combined also, but for brevity let it be assumed for the present that separate d.c. and a.c. windings are employed on the stator, as is actually most convenient in the smaller sizes.

The alternating side of the machine may also be caused to operate as an induction machine if the points which before were connected to slip rings are short-circuited. Under such circumstances currents of slip frequency will flow through the short-circuited connections and the slip rings may be eliminated. In this case, of course, the short-circuited points need not be limited to three so long as care is taken that only points two pole pitches apart of the six-pole flux are connected. This type of machine, owing to the absence of slip rings and of the necessity of d.c. excitation of the rotor, is most suitable in small sizes.

In the case of the induction machine it is no longer true

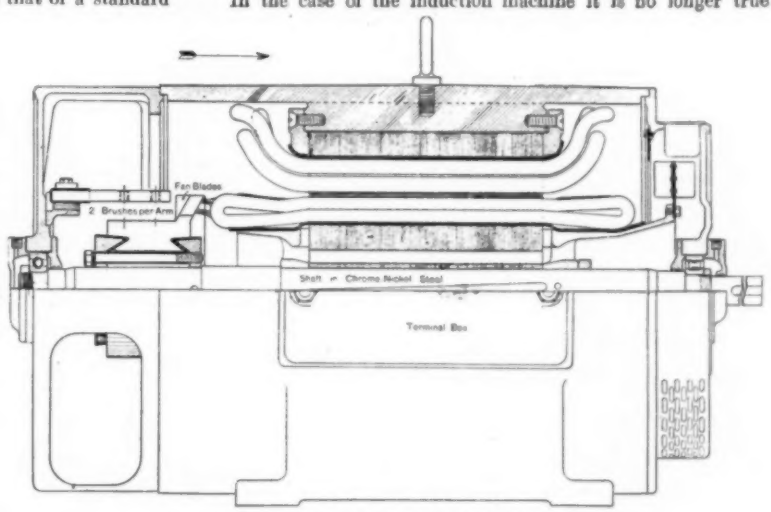


Fig. 3.—Sectional Elevation of Machine.

to say that one flux is stationary with respect to the rotor and the other with respect to the stator. The flux which is now generated by the alternating-current winding on the stator is in slow rotation with respect to the rotor also, the effect of which is to superimpose a tiny ripple (of an amplitude of perhaps one half per cent. of that of the direct-current voltage) on this voltage; the ripple is of absolutely no significance. Of course, the machine is not limited to two and six poles, but can be built for many other ratios of poles.

The practical construction of a machine of small size arranged

for two and six poles needs 24 slots in the stator, six of the slots being devoted to a shunt winding. In order to prevent the two-pole flux inducing very high e.m.f.'s in the shunt winding, which may have a very large number of turns, it is necessary to ensure that the alternating e.m.f.'s in the shunt winding shall cancel out turn by turn; for this purpose the winding is made as a single long coil, each turn passing from the first slot through the whole of the six slots before returning to the first again as is shown in fig. 4. Intermediate between any two adjacent slots of the shunt winding are three other slots. In parts of those slots next to the air gap is placed a two-pole three-phase winding of the ordinary concentric type, while in the rear of the same slot is placed the interpole winding.

in standardised sizes up to 50 kW. Fig. 5 is a curve of the full-load efficiencies of all the sizes mentioned plotted against kW rating, and other advantages claimed for this type of machine include the following: No slip-rings are needed, synchronising is unnecessary, high power factor, transformers never required, effective on single-phase circuits, can be made to run at any speed independently of the number of poles on the d.c. side, and its efficiency is about equal to that of a rotary converter of moderate size. It will thus be appreciated that the characteristics of the binary machine closely resemble those of a motor-generator, excelling chiefly over the latter by virtue of greater compactness, lighter weight, and higher efficiency, together with moderate cost.

Applications of the binary converter are many and diverse,

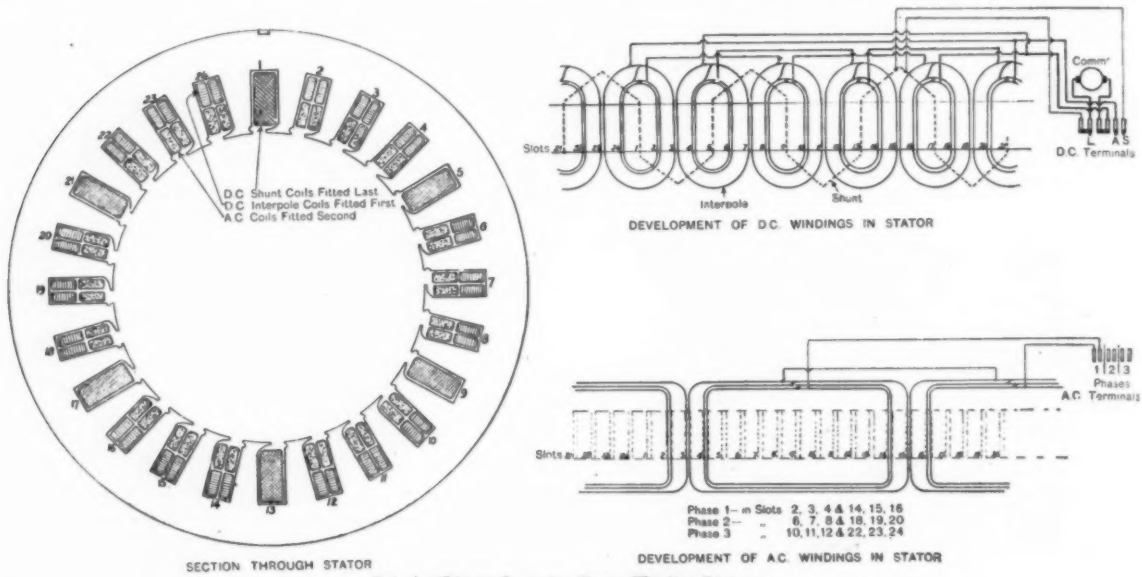

D.C. Shunt Coils Fitted Last
D.C. Interpole Coils Fitted First
A.C. Coils Fitted Second
SECTION THROUGH STATOR
Comm'r
Slots
D.C. Terminals
Interpole
Shunt
DEVELOPMENT OF D.C. WINDINGS IN STATOR
A.C. Terminals
Phases
Phase 1— in Slots 2, 3, 4 & 14, 15, 16
Phase 2— " 6, 7, 8 & 18, 19, 20
Phase 3 " 10, 11, 12 & 22, 23, 24
DEVELOPMENT OF A.C. WINDINGS IN STATOR

Fig. 4.—Binary Converter Stator Winding Diagram.

The rotor consists of a d.c. armature of a perfectly normal type, corresponding to that of a two-pole machine, and short-circuited along a number of points (each two pole pitches apart) of the d.c. winding. Such a machine, in essence, consists of an induction motor driving a direct-current generator, both having common magnetic circuits and common windings. On the d.c. side it has all the characteristics of the d.c. interpole generator, *i.e.*, it can be compounded by moving the brushes off neutral, the d.c. voltage can be regulated by a field rheostat in the usual manner, and it can be started in the same way as a squirrel-cage induction motor, not requiring synchronisation.

The starting gear of the binary converter is that appropriate to a squirrel-cage induction motor. The smallest size of converter may be switched directly on to the line; for sizes of from 1 to 5 kW star-delta starters are employed, while

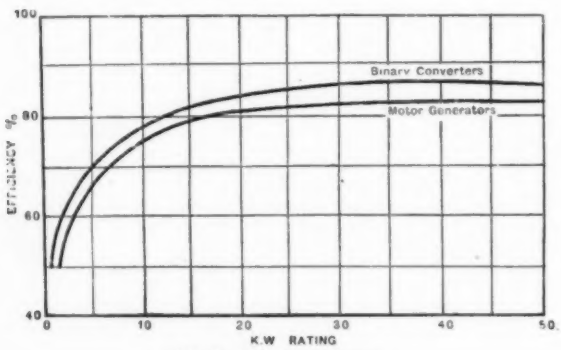


Fig. 5.—Efficiency Curves.

for larger sizes either an auto-transformer starter may be employed or a type which has been specially designed for the purpose; the latter, in the starting position, inserts a choke in series with the line in order to cut down the voltage supplied to the motor, and in the running position connects the terminals of the motor directly to line. It should be pointed out that the binary converter always starts on absolutely no load, and only has to accelerate its own rotor against the friction of the brushes. It is therefore possible to reduce the starting current of a squirrel-cage motor to a very low figure, not exceeding twice full-load current; or, when an auto-transformer starter is used, one and a half times full-load current.

Binary converters are being built under Mr. F. Creedy's patents and placed on the market by Messrs. Maudsley's, Ltd.,

of course, and special applications include the possibility of obtaining Ward-Leonard control with a "single-unit" set. The converter could be mounted with a suitable small exciter and d.c. motor on a common bedplate, or the motor might be separately located, and the complete combination requires no more space than does a d.c. motor with worm gear and pony motor, so often used for driving a printing press at inching speeds for example. At the same time, the binary arrangement eliminates the elaborate control frequently required, since a Ward-Leonard unit is controlled entirely by means of field rheostats, as shown in fig. 6, in which the

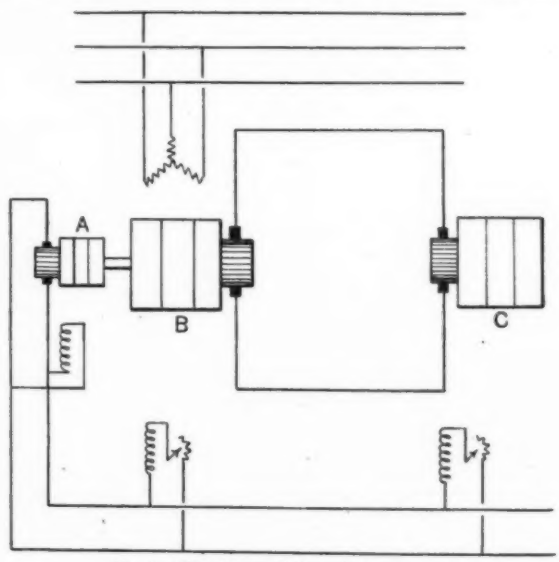


Fig. 6.—Ward-Leonard Control Arrangement.

exciter A (which is required for such applications so that voltage regulation at the binary commutator may not vary the voltage across the motor field) is shown mounted on a common shaft with the binary B; it excites the two fields of the binary and motor C in parallel, the commutators of the two machines being permanently coupled together. For printing press work the two field rheostats are operated by a small auxiliary motor which first cuts out the resistances in the converter circuit, thereby raising its voltage to the

maximum, and next weakens the field of the motor to obtain still higher speeds. The auxiliary motor which operates these field rheostats is controlled by push buttons mounted on various parts of the press in the usual manner.

For certain purposes the motor has to run at not more than 3 per cent. of its maximum speed, the total speed range, therefore, being 33 to 1; by means of the arrangement just described this very wide speed range can, it is stated, be easily accomplished. Where such extreme speed ranges are not required regulation of the strength of the motor field may often be omitted, the whole of the control being effected by means of the converter. Moreover, since the binary converter can be accurately compounded, very close speed regulation with increasing loads can be obtained. Automatic control as applied to the binary is claimed to represent considerable simplification, and steps are being taken in conjunction with control-gear specialists to adapt standard methods of automatic control for sub-station purposes.

For arc-welding the advantages of the binary converter are chiefly that a short circuit on the d.c. side does not mean a short circuit on the a.c. side, as there is no electrical connection between the two, and the independence of the voltages renders it possible to design the d.c. side with the required drooping-voltage characteristic.

A New Type of Boiling Plate.

An I.M.E.A. Exhibit.

ONE of the exhibits which is attracting a great deal of attention at the I.M.E.A. Exhibition at Glasgow this week is a new type of boiling plate shown by Metro-Vick Supplies, Ltd. This new "Cosmos" product is of the totally-enclosed type and has some unusual design features, being based on the invention of Mr. Christian Bergh Backer of an entirely new method of manufacturing electric heating elements, a new insulating material being produced in the process. The insulating substance consists of crystalline magnesium oxide (or hydroxide), made by treating pure magnesium metal in steam under high pressure, or alternatively in water under high pressure and at raised temperature. The crystalline magnesium hydroxide and oxide so obtained have been found to be fairly good heat conductors, whereas in any other form the material is a very bad conductor of heat. It is also known to be of the best of electrical insulators at high temperatures, and the combined properties have proved of great value in the new boiling plate elements.

Experiments on the production of heating elements for such as boiling plates for kitchen ranges, were started by the inventor of the process at the beginning of the year 1921, and the results soon proved that the new magnesium oxide was far superior to anything previously tried out as an insulating medium in electric boiling plates. The plate itself is of a special heat-resisting cast-iron, on the underside of which is a cast groove running in a spiral from the centre of the plate to the edge, fig. 1. Into this groove is placed a flexible magnesium-metal "tube" which has the coiled-up resistance wire inside it. The outside diameter of a magnesium "tube" is such that the tube fits tightly into the groove in the cast-iron plate, fig. 2. The plate is now placed in an autoclave and treated with steam, whereby the magnesium metal "tube" is converted into a similar "tube" of crystalline magnesium hydroxide. During the conversion the material grows or expands, so that the insulation becomes about twice as thick as the metal was before conversion, fig. 3. This expansion of the oxide is a very important attribute, as the coil of resistance wire thereby becomes completely embedded in the oxide, and is not only held firmly in place, but intimate thermal contact is assured. After the oxidising process is completed, the spaces in the grooves are filled with alumdum cement; a thin mixture is used, so that it runs easily down into all the openings and fills out the groove in the cast-iron plate completely. Whilst the cement is wet, an asbestos disk is placed over the coil and the element is finished off with a cast-iron press plate held in place by a screw in the centre, fig. 4. The insulation as yet is magnesium hydroxide (not oxide), as the temperature must be raised to over 300 deg. C. in order to drive off the "hydroxide water." Once the plate has once been dried out, any moisture which may enter it subsequently, either by soaking or by leaving it for several weeks in extremely damp air, is easily driven off by switching on the current for a few minutes. The actual wire used has been chosen as the result of exhaustive tests which have been carried out by the Metro-Vick Research Department on the behaviour of resistance wires at widely different temperatures. One very important characteristic of crystalline magnesium oxide is its elasticity. It has been found that after several thousand hours' use the formation of the oxide crystals is exactly the same as it was immediately after conversion from the magnesium metal, which supports the claim that this form of oxide positively does not break up into powder. The result is that the wire always remains compactly embedded, and the "breathing" of the wire during heating and cooling is amply taken care of by the elasticity of the magnesium oxide.

The "Cosmos" 8 5/16-in. diameter boiling plate of 2,000 W loading will reach the maximum temperature of about 600 deg. C., that is, red hot, if left uncovered by a utensil. This plate, it is claimed, will stand running red hot for years without burning out the resistance wire, because the wire itself, even with this extremely high loading, never comes up to a higher temperature than about 750 deg. C., at which heat the best grades of nickel-chromium wire will stand indefinitely in any elements where air for all practical purposes cannot get in contact with the wire.

The high loading permissible on these plates is only made possible owing to the comparatively high thermal conductivity of the crystalline magnesium oxide, and also on account of the fact that the element is embedded in the cast-iron itself so that the heat generated in the coil has a free and uninterrupted path through the oxide to the surface of the plate.

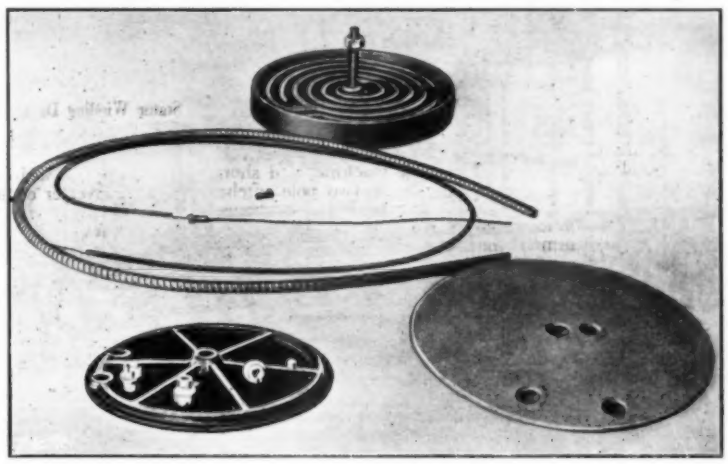


Fig. 1.—Boiling-plate Parts, Unassembled.

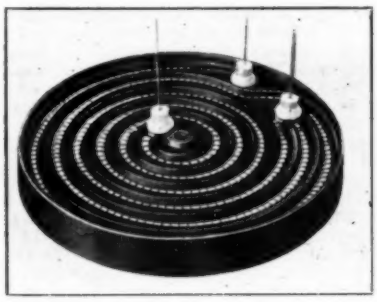


Fig. 2.—Magnesium Tube Before Oxidisation.

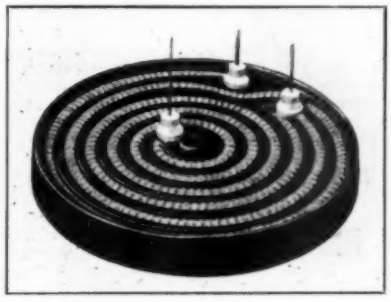


Fig. 3.—Tube After Conversion.

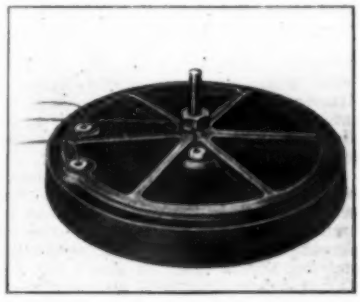


Fig. 4.—Complete Boiling Plate.

The following figures which have been obtained during tests by the National Physical Laboratory regarding the operation and serviceability of this boiling plate, add to the interest of these particulars. Two pints of water were brought to the boil from 60 deg. F. in 8.5 min. on a consumption of 285 Wh; three pints in 10.75 min. on 360 Wh; four pints in 13 min. on 435 Wh; and five pints in 15 min. on 505 Wh.

The smaller quantities of water were boiled in a cast-aluminium kettle with a machined bottom measuring 8 in. in diameter, and weighing 1 lb. 12¼ ozs. The larger quantities were boiled in a cast-aluminium saucepan with a machined bottom measuring 7⅞ in. in diameter, 4¼ in. high, weighing 3 lb. 8¼ oz. It is claimed that after the plate has been on circuit for from five to ten minutes, its efficiency approaches 90 per cent.

The boiling plates are at present made in two sizes, 8¼ in. and 6¼ in., with loadings of 2,000 and 1,200 watts respectively for 100-250 volts.

The process above described is in no way restricted to the manufacture of boiling plates; it is claimed that it can be utilised for all types of heating elements in use at the present time and we look forward to developments in this direction with interest.

An Electricity-Supply Emergency Organisation.

Measures Adopted by the North-East Coast Supply Companies During the General Strike.

THE following particulars have reached us concerning the position of the North-East Coast Power Companies during the general strike. On May 6th official notice was received by the Newcastle-upon-Tyne Electric Supply Co., Ltd., and its Associated Companies, that certain grades of their employés would be called out on strike at the end of the evening shift. This notice affected 889 men, of whom a certain number were engaged in such duties as construction work, which automatically came to an end in the time of emergency. It was only necessary to replace those strikers who were engaged at the three main coal-fired generating stations and the sub-stations. In an extremely short time arrangements were made to draft a large number of emergency workers into these parts of the system, 281 of whom were members of the staffs of the companies or their consulting engineers, Messrs. Merz & McLellan, and were mainly drawn from the technical and clerical personnel.

The number was made up by the addition of many outside volunteers, including a number from local engineering or electrical works, or contractors. Others were supplied by the Armstrong college union or the local voluntary-service organisation. Many offers of help were received from firms or individuals in the district, which the companies had regretfully to decline.

The task was by no means completed with the replacement of the industrial staff; it was found necessary that the emergency workers in the various stations should be housed on the premises, and a welfare organisation was formed to provide sleeping accommodation for all who were confined to the power stations, and to cater for about 700 workers. At the Carville station a temporary hut was available, and in this and the offices 147 men were housed. At the Dunston and North Tees stations there were no buildings which could be used for sleeping purposes, but the London and North-Eastern Railway Company provided a train of seven coaches at each power house, which made very comfortable sleeping quarters. In addition to the main power stations, there were 18 rotary sub-stations which had to be permanently manned. One man per shift was drawn from the technical staff and two non-technical men on each shift were obtained from the volunteers to be available for any emergency which might arise.

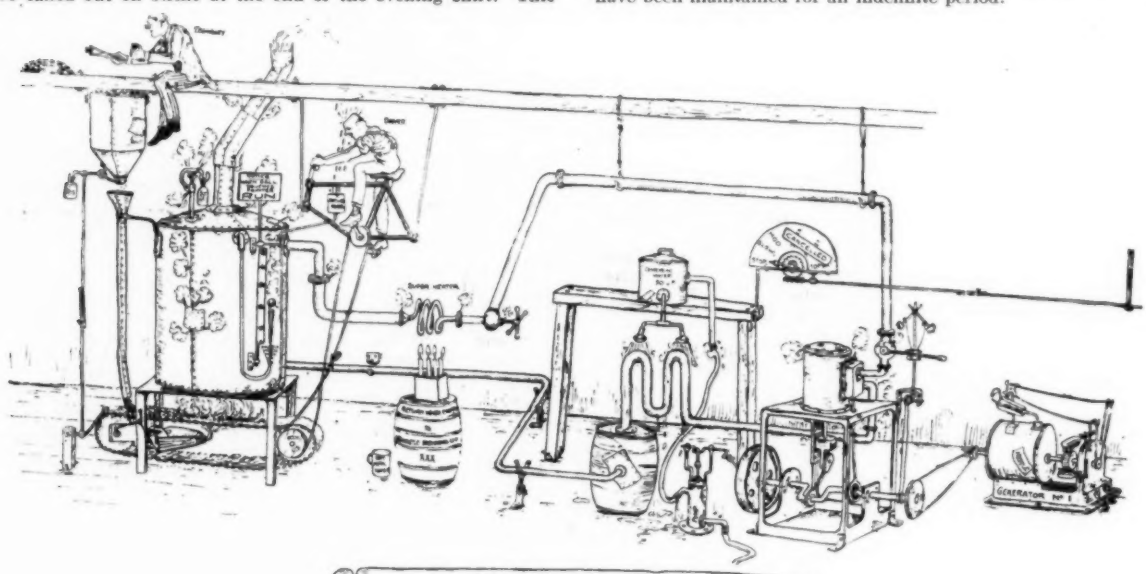
Under a chief welfare officer at the head office, an officer was allocated to each station, who was responsible for all the arrangements for accommodation and catering. At the North Tees power station and the garage cooking was done entirely by electricity, while at the other two generating stations army field kitchens were used. To keep the staff at the various stations in touch with the activities of the company, a news bulletin, "Nesco News," was issued daily.

The transport work was done wholly by volunteers, who were drawn mainly from the existing staff of the company, with the addition of a few helpers from outside.

Transport officers were appointed, who were on duty night and day, and a certain number of the emergency transport workers slept on the premises. Some idea of the amount of work done by the transport organisation during the emergency period may be gathered by the fact that the 80 cars and 12 lorries employed covered over 30,000 miles. The work included the transport of members of the clerical staff to and from their work; many of them living ten to fifteen miles from their offices.

In addition to road transport, a considerable amount of work was done on the River Tyne. A prominent shipbuilding company placed a launch and crew at the companies' disposal, which was available night and day for transporting men and material between the Dunston and Carville stations and Newcastle. By this means laundry work, letters, parcels and the amenities of life were dealt with.

The result of the work done by the emergency organisation was that no single consumer in the companies' territory of 1,400 square miles was subject to any interruption of supply as the result of the general strike. The organisation which was, of course, at the first rough and ready, daily became more perfect, and there is little doubt that supplies could have been maintained for an indefinite period.



THE VOLUNTEER'S DREAM.

The accompanying illustration, an effort by Mr. Collingwood, of the Newcastle-upon-Tyne Electric Supply Co., Ltd., represents his idea of the impressions of the inner working of the generating station on the mind of the "volunteer."

Investment and Production in the United States.—In the course of an address delivered at the recent annual convention of the National Electric Light Association, Mr. Samuel Insull, president of the Commonwealth Edison Co., said that sales of electrical energy in the United States lagged behind the increasing investment in plant and equipment and were not keeping pace with the increase in generating capacity. It was satisfactory to see that the reduction of the cost per kW of plant by improved methods of generating electricity had resulted in the average investment being reduced from $425 per kW in 1912 to $294 per kW in 1923. It would naturally be concluded from this that the number of kWh generated per dollar invested had automatically increased. From 1912 to 1923 that was true, the number was nearly doubled. In 1924, however, the figure fell from 10,000 kWh per dollar invested to 9,450 kWh, and in 1925 there was a further decline of 9,300, a fall of 7 per cent. in two years. When the relation of generated energy to plant capacity was considered the unsatisfactory position was accentuated. In 1912 the average number of kWh generated per kW of capacity was 2,240. By 1917 it had risen to 2,820 and it remained at about this level until 1923, when it fell to 2,450, receding further to 2,410 in 1924. There was a slight improvement in 1925, when a figure of 2,440 kWh per kW was reached. Mr. Insull deduced from those figures that the supply industry of the United States, on the whole, was not expanding and increasing its business as fast as it should.

The Electricity (Supply) Bill.

The Proceedings in Committee.

(*Continued from page* 888.)

STANDING Committee C of the House of Commons resumed consideration of the Electricity (Supply) Bill on June 7th, the Committee having decided to sit on two or more afternoons in each week in order to facilitate the progress of the Bill.

Sub-section (2) of Clause 2 enables the Central Electricity Board to delegate powers to "any authorised undertakers or other bodies." Mr. ATTLEE (Limehouse, Lab.) proposed to leave out the words "or other bodies" and to insert instead the words "being a local authority or group of local authorities." He explained that the Board might at any time, without the consent of the Electricity Commissioners, delegate its powers to any authorised undertakers or other bodies, to be exercised by such bodies on behalf of the Board. The Labour party was desirous of maintaining public control. There was nothing in the clause, as it stood, to prevent the Board, if it so wished, from delegating, for instance, the whole of its powers in the Yorkshire area to the Yorkshire Electric Power Co., although probably some of the local authorities would have something to say in that case. The Labour party said that if there was to be delegation, it should only be to public authorities.

Sir DOUGLAS HOGG, the Attorney-General, in resisting the amendment, said that if the Committee was going to set up a Board and give it powers of delegation, it should trust the Board to exercise those powers reasonably. He was always in favour of delegation, in proper instances, being entrusted to local authorities; but equally, in proper instances, when the authorised undertakers were in fact private companies, he saw no reason why the same power of delegation should not be exercised. The effect of the amendment would be that, when an undertaker was a private company, there would be no power to delegate to it any powers, though exactly similar powers in an adjoining area, where the local authority was the authorised undertaker, would be delegated to that local authority. That was not a reasonable proposal.

Sir JOSEPH NALL (Manchester, Hulme, U.) suggested that the Committee should delete the words "or other bodies," but should not insert the words "being a local authority or groups of local authorities." He said that, wherever the Board proposed to delegate its powers, it ought to do so to the authorised undertaker in that district.

Mr. G. BALFOUR (Hampstead, U.) supported this view, which was eventually adopted by the Committee. The words "other bodies" were deleted from the clause, but the substitution for them of the words "being a local authority or group of local authorities" was negatived by 40 votes to 11.

Mr. ATTLEE then moved the insertion of the following new sub-section:—"(3) The Board shall, with twelve months from the date of this Act, or such later date as may be approved by the Electricity Commissioners, submit to the Electricity Commissioners a scheme providing that in the district of any joint electricity authority or other body formed under the provisions of Section 6 of the Electricity Supply Act, 1919, and any Act amending the said Act, all the powers and duties imposed upon and entrusted to the Board under this Act shall be exercised on behalf of the Board by such joint electricity authority or other body, and any such scheme shall contain provisions enabling the Board to resume the exercise of its powers and duties in such district or districts in default of such joint electricity authority or other body." He said that the amendment was a mandatory one, directing the Board to make a scheme for delegation in certain definite areas.

Lt.-Col. MOORE-BRABAZON, Parliamentary Secretary to the Ministry of Transport, opposed the amendment, which, he said, would be almost a breach of faith with regard to past legislation. The amendment was negatived by 28 votes to 10, and Clause 2 was then added to the Bill.

Clause 3 provides: "(1) that the Board shall appoint one or more consultative technical committees consisting of engineers employed in connection with generating stations which are by virtue of this Act for the time being selected stations; and that (2) a consultative technical committee shall give advice and assistance on such matters as may be referred to the committee by the Board, and for that purpose the Committee shall meet from time to time as the Board may determine." An amendment to substitute the Electricity Commissioners for the Board was negatived, but a further amendment, moved by Mr. CLAYTON (Widnes, U.) to make it optional instead of mandatory on the Board to appoint committees of technical engineers was accepted by the Government and agreed to.

The Committee then adjourned.

On the resumption of the proceedings on June 8th, Sir D. HOGG moved an amendment to insert after the word "with" in sub-section 1 the words "undertakings owning." He said that the clause provided for the appointment of consultative technical committees, consisting of engineers employed in connection with generating stations, but sometimes a chief engineer of a large undertaking might not be actually employed in connection with the particular generating station which had become a selected station, and it would not be desirable to make him ineligible for the Committee; hence the amendment, which was agreed to.

On the motion that the clause stand part of the Bill, Mr. G. BALFOUR opposed the clause, as Clause 1 was quite wide enough to provide the Board with all the technical consultative assistance that was required.

After further discussion the clause was added to the Bill.

Clause 4 makes it the duty of the Board to submit a scheme to the Electricity Commissioners. Mr. R. HUDSON (Whitehaven, U.) moved an amendment to provide that the Commissioners should prepare and submit a scheme to the Board, explaining that this and other amendments which he proposed to move carried out a suggestion which he made earlier in the Committee's discussions. The Board would hear all objections and afterwards publish the scheme, which would be, in essence, a considered judgment by an impartial tribunal, as it were a court of appeal. After that, an impartial appeal tribunal would be set up to consider the case of anyone who felt that his interests were unreasonably affected, the only proviso being that no alterations in the fundamental principles of the scheme might be made by any decision of that appeal tribunal.

Sir D. HOGG, without pledging himself to the exact wording of the amendment, said that the view of the Government was that Mr. Hudson's scheme was a reasonable and fair one. It met the difficulty which the Government had felt of increasing cost and delay so much as to render the scheme financially impracticable. Therefore, the Government proposed substantially the scheme that Mr. Hudson had put forward.

Mr. ATTLEE opposed the amendment, saying it would involve the complete remodelling of the Bill and the practical abolition of the Commissioners.

Sir J. NALL said that the new proposal would result in prolonged delay. For how long was development to be held up owing to uncertainty about the present Bill?

Mr. HARDIE (Glasgow, Springburn, Lab.), who opposed the amendment, declared that the Bill was being forged to protect private interests.

Sir C. WILSON thought the best thing was to take the Bill back and recast it, for it was quite unworkable.

Sir D. HOGG said that if the Bill was passed by the end of next month the Commissioners hoped that schemes for certain areas would be submitted to the Board before the end of the year, and, if all went well, he saw no reason to doubt that those schemes might actually become operative in the early part of next year. He hoped the Bill would receive the Royal Assent by the end of July.

Mr. Hudson's amendment was carried by 29 votes to 13.

Mr. GRANT (Derby, U.) moved to insert after the words "that the Electricity Commissioners shall prepare and submit to the Board a scheme," the following:—"or schemes relating to the respective areas specified therein."

Sir D. HOGG agreed that there must be schemes for different areas, but there must ultimately be one scheme for the whole country, of which each separate area would form a coherent part.

The amendment was carried by 38 votes to 18.

Mr. CLAYTON (Widnes, U.) moved an amendment to make it feasible for the Board to leave the construction of the transmission lines to independent parties, because the scheme would work very much better if it were split up into areas. He was no believer in the "national grid"; he wanted the different areas to be linked one with the other, but would like the areas to be worked independently, because, although 50-cycle alternating current was the best method of generating and transmitting at the moment, it did not necessarily follow that it would always remain so. It was a false step to stereotype for the whole country, and it would be very much better if each large area (the country might be divided into six or 60 divisions) were left to work out its own method of generation and supply; they could be linked, and the amount of electricity that was likely to pass from one area to another would be only a small proportion of the energy generated. There was no particular reason why Newcastle with 40 cycles should be altered to 50; Birmingham believed that 25 cycles suited its requirements; it was possible that the generation and transmission at high voltage by direct current might also prove a success.

Lt.-Col. MOORE-BRABAZON said that one of the fundamental principles of the Bill was that the Board should retain power to acquire and maintain such lines as it wished.

The amendment was withdrawn, and the Committee adjourned.

The proceedings were resumed on June 10th, when discussion was continued on Clause 4.

Sir D. NEWTON (Cambridge, U.) moved that the standard frequency should "ultimately be the same throughout the country." Personally, he was doubtful whether the standardisation of frequency could ever be obtained.

Lt.-Col. MOORE-BRABAZON, while sympathising with the object of the amendment, pointed out that the frequency was only to be changed when it could be clearly shown that from the point of view of pounds, shillings, and pence there was an advantage to change it to 50 cycles, *i.e.*, when there was a "spilling over" of current from one to another area. With

regard to the railways, they used direct current which was from 25-cycle a.c. If they were to be compelled to change in every case from 25 cycles to 50, their plant and plans would be dislocated.

Mr. G. BALFOUR declared that the railway services were entirely independent of the standardisation of frequency.

After some discussion, in the course of which it was pointed out that the general debate on the question of standardisation of frequency would come on Clause 9, the amendment was withdrawn.

Sir J. NALL moved that the period of the temporary arrangements to be made between the Board and the owners of generating stations with respect to the giving and taking of to and by the Board of supplies of electricity, &c., should be limited to the period of carrying out of the works specified in the scheme, was accepted by the Government and agreed to.

A further amendment, moved by Mr. R. HUDSON, to leave out the proviso that the temporary arrangements should be based "upon such terms as in default of agreement may be determined by the Electricity Commissioners" was also accepted by Sir D. Hogg, and agreed to.

Sir D. Hogg accepted an amendment, moved by Mr. FIELDEN (Manchester, Exchange, U.) to provide that generating stations operated by railway companies at the date of the passing of the Act should not be chosen as "selected stations." Sir D. HOGG pointed out that the railways at present were not coming into the scheme. They used direct current, and their generating stations were, therefore, not required under the scheme. The railway companies' request to be specially excluded was not unreasonable, and the Government had acceded to it.

Another amendment was agreed to exempting generating stations owned by dock authorities from being "selected stations."

Lt.-Col. MOORE-BRABAZON resisted an amendment, moved by Sir J. Nall, asking for an inquiry to be held by the Board if representations were made to it after the publishing of the scheme. After some debate, the Attorney-General undertook to move an amendment to give power to the Central Board to hear parties if it thought fit, and on this understanding Sir J. Nall withdrew his amendment. Later, the Attorney-General's amendment was agreed to.

Mr. CLARRY (Newport, U.) said that the gas industry was desirous of co-operating with the electrical industry through the Bill, primarily with regard to the selection of sites and the formation of schemes with regard to fuel, and at a later stage with regard to distribution.

Sir D. HOGG welcomed this statement, seeing in it an opportunity properly to co-ordinate the country's fuel resources.

The Committee adjourned.

(To be continued.)

Italy's Electrical Trade.

THE following statement, showing the imports into and exports from Italy of electrical goods during 1925 has been compiled from the recently-issued official trade statistics. The figures for 1924 are added for purposes of comparison and notes of any increases or decreases are made:—

IMPORTS.

	1924. Quintals.	1925. Quintals.	Inc. or dec. Quintals.
Electric generators and motors—			
Total	17,000	24,000	+ 7,000
From Austria	700	1,400	+ 700
,, Germany	6,200	12,000	+ 5,800
,, Great Britain	270	800	+ 530
,, Hungary	2,700	4,500	+ 1,800
,, United States	2,000	650	− 1,350
Static transformers—			
Total	6,700	11,000	+ 4,300
From Austria	200	500	+ 300
,, Germany	4,100	7,000	+ 2,900
,, Germany (Reparation account)	640	—	− 640
,, United States	1,200	600	− 600
Electricity meters—			
Total	7,000	5,700	− 1,300
From Germany	6,000	4,500	− 1,500
,, Switzerland	500	900	+ 400
Telegraph and telephone apparatus—			
Total	1,800	2,600	+ 800
From Germany	600	1,200	+ 600
,, Germany (Reparation account)	270	40	− 230
,, United States	50	130	+ 80
,, Belgium	150	120	− 30
Carbons, electric—			
Total	50,000	51,000	+ 1,000
From Germany	13,700	19,000	+ 5,300
,, Jugo-Slavia	10,600	3,000	− 7,600
,, United States	19,000	24,000	+ 5,000
Insulators, porcelain, &c.—			
Total	23,000	21,000	− 2,000
From Germany	13,800	12,700	− 1,100
,, United States	3,600	4,400	+ 800
Steam boilers—			
Total	39,000	18,000	−21,000
From Germany	19,500	4,000	−15,500
,, Great Britain	7,900	13,000	+ 5,100
,, Czecho-Slovakia	10,000	1,000	− 9,000
,, Switzerland	100	100	—
Electric lamps—			
Total (thousands)	13,100	16,700	+ 3,600
From Austria	2,400	1,700	− 700
,, Germany	5,800	5,700	− 100
,, Holland	7,800	7,800	—
,, Switzerland	135	137	+ 2
,, Hungary	330	1,040	+ 710
Insulated electric wire or cable, covered with rubber or textiles	1,700	1,500	− 200
Ditto, armoured, including submarine cables	3,000	2,500	− 500

EXPORTS.

**Insulated electric wire or Cable, covered with rubber or textiles*	4,200	5,100	+ 900
**Ditto, armoured, including submarine cables*	20,000	22,000	+ 2,000
Electric generators and motors—			
Total	17,800	16,170	− 1,630
To Belgium	2,000	500	− 1,500
,, France	1,500	1,100	− 400
,, Spain	2,000	900	− 1,100
,, India	2,300	3,100	+ 800
,, Argentina	3,600	2,300	− 1,300
,, Brazil	3,400	5,000	+ 1,600
Static transformers	1,700	1,700	—
Accumulators	2,000	2,000	—
Magnetos	440	500	+ 60
Electricity meters	90	70	− 20
Telegraph and telephone apparatus	77	106	+ 29
Radio apparatus	250	370	+ 120
Insulators, porcelain, &c.	280	480	+ 200

* Principal destinations: United States and Argentina in 1924, and Argentina, Peru, Poland, Cuba and United States in 1925.

Legal.

British Thomson-Houston Co., Ltd., v. Siderman.

MR. JUSTICE TOMLIN, in the Chancery Division on June 8th, gave judgment for the British Thomson-Houston Co., Ltd., against L. Siderman, in an action for an injunction restraining infringement of the plaintiffs' patents for gasfilled electric incandescent lamps and leading-in wires, in default of defence.

This was the case in which the importance was urged of granting injunctions *ex parte* owing to the difficulty of stopping the importation and sale of lamps infringing the plaintiffs' patents. Counsel now said that that action was started against three defendants, Wood, Siderman and a company owning the wharf to which the lamps were traced, but the action was discontinued against the company upon hearing their evidence. Both patents had been held to be valid.

Fellows Magneto Co., Ltd., v. E. H. Druce & Co.

MR. JUSTICE MACKINNON, in the King's Bench Division on June 11th, had before him an action brought by the plaintiffs to recover the sum of £425, balance of account for a quantity of machinery and plant sold to E. H. Druce and Company, Coventry. Mr. H. D. Samuels was for the plaintiffs and Mr. J. F. Eales for the defendants.

Opening the case for the plaintiffs, Counsel stated that in July, 1925, his clients made a contract orally that defendants should purchase machinery from them, which consisted of a number of lathes, screw slotters, and milling machines, at a price of £1,235. That contract was confirmed by invoices and it was part of the contract that the payments were to be made at once and that the goods were not to be removed from the plaintiffs' works before payment. In July defendants paid £850 and removed part of the goods. Defendants' case was that the contract was not completed inasmuch as the machines were not complete and were lacking equipment; that prevented the defendants from again selling at a profit and as a result they counterclaimed for £314.

His LORDSHIP held that the defendants' view of the contract was the right one, and entered judgment for the defendants on the claim and the counterclaim with costs.

Electrical Companies and Directors Fined.

THE *Birmingham Post* reports that at the Birmingham Police Court, on June 9th, the Stipendiary (Lord Ilkeston) inflicted fines of £20 and five guineas costs in each case on the Warwickshire and South Midland Electricity Supply Corporation, Ltd., and the Electric Light and Power Contracts Finance Corporation, Ltd., for failing to file their annual summaries

of account at Somerset House. The following directors were fined £20 for permitting the default, except in the case of Bridgen, who only joined the board of the Electric Light and Power Company at the end of last year, the fine in his case being £10. Of the Warwickshire Corporation: Wilfred Burton, London; Emerton Claude Buik, Dulwich; Walter Thompson, West Hampstead; and Edward Bennett Calvert, London. Of the Electric Light and Power Company: Sir Charles B. Hearne Soame, Bart., Coalbrookdale, Salop; James Bridgen, London; Christian Ernest Paul Groth, Soho, London; Eliot Foley Hill, London.

Mr. E. W. TUNBRIDGE, on behalf of the Board of Trade, said the Warwickshire Company filed a return up to March, 1924, but nothing further in the way of an annual return was forthcoming from it until a few days ago, after the summons was issued. With regard to the Electric Light Corporation, no annual summary was filed until June 4th this year, though the company was incorporated on April 16th, 1924. The summary then submitted had been accepted and filed.

For the defence Mr. HAROLD ELWELL stated that all the directors of the two companies were present with the exception of Mr. Hill, who had communicated with the Court, and Sir Charles Soame, who had sent a medical certificate. The directors accepted responsibility and had instructed him to say that the omissions arose through a dispute with a firm of accountants employed to keep the books. Further, Mr. Alan Eaden, who was secretary of both companies, died in September last year. ROBERT PAUL HARLEY, the new secretary to both companies, said that when he took over in September last the accounts were in a chaotic state, and he had had considerable difficulty in making up the accounts.

Alleged Mercurial Poisoning.

THE judgment of his Honour Judge Ruegg, was read by Judge Dobb at the Birmingham County Court on June 9th, in a case under the Workmen's Compensation Act. The point at issue was whether the workman died from mercurial poisoning or natural causes. The claim of the widow was heard in April by Judge Ruegg, who sat with a medical assessor (*vide* ELEC. REV., May 7th, p. 762). The deceased man, named Richard Goffe, was a meter inspector in the employ of the Birmingham Electric Supply Department, and the plaintiff was his widow, Lucy Goffe. The amount of the claim, £520, was not disputed by the Corporation, but it was held that the death was due not to mercurial poisoning, as the plaintiff submitted, but to an obscure germ.

Judge RUEGG held that, although he accepted the evidence that death was due to myelitis, he thought that deceased would not have died but for mercurial poisoning. The germ was one which attacked people of low vitality. Judgment was accordingly given for plaintiff.

Stepney Ratepayers and Electricity Stoppage.

THE *Daily Telegraph* reports that a case arising out of the general strike was heard at the Town Hall, St. Georges-in-the East, on June 10th, when Messrs. Buck & Hickman were summoned in respect of the non-payment of a portion of the general district rate. The Town Clerk (Mr. V. B. Bateson) represented the Stepney Borough Council, and Mr. T. J. O'Connor appeared for the defendants.

Mr. O'CONNOR said that the defendants had never previously refused to meet their due obligations in the matter of rates, and they desired to have the reasons stated why they now refused to pay. By criminal conspiracy to control the supply of electricity for a political purpose the Borough Council deprived them unlawfully of electricity supply from May 3rd to May 12th. The supply was only restored on May 13th, the day before the general strike ended.

Mr. BATESON said that that was an allegation of a serious character, and was absolutely groundless.

Mr. O'CONNOR quoted a section of the Electric Lighting Confirmation Order to show that the Council was liable to penalties, except where failure to supply was due to accident or *force majeure*, and said that as a result of the failure to supply sixty-five men were thrown out of work, the firm being deprived of power. There was no *force majeure* because the Electricity Commissioners had broadcast a notice that they were prepared to supply volunteer labour to carry on such undertakings wherever required. The Council took no steps to avail itself of this offer, but used its position wrongfully to prevent his clients "obtaining money with which to pay the rates, which I say is action of a criminal character against a law-abiding firm."

Mr. BATESON protested. Every statement made, he said, was a misrepresentation.

The CHAIRMAN, after consultation, said there would be an order for the payment of the rates, which could be paid under protest, and the defendants could take any action they pleased after that.

Gilbert Gilkes & Co., Ltd., v. Marshall.

BEFORE Mr. Justice Talbot, on June 8th, at the Lancaster Assizes, Messrs. Gilbert Gilkes & Co., electrical engineers, Kendal, sued Mrs. E. E. Marshall, Keswick, to recover £126 7s. It was stated that there was a contract for renewing and recharging the cells of the battery in defendants' power house, and the plaintiffs' electrician did the work in March, 1925. After the electrician had left the premises a fire broke out and destroyed the power house. Defendant received £250 from an insurance company, but denied liability to pay Messrs. Gilkes because they had not handed over the job and their workman had been negligent in leaving the door of the power house locked when he knew that dangerous gases came from the charging of new accumulators.

Expert evidence was given for the defence on June 9th by Mr. JULIUS FRITH, M.Sc., M.I.E.E., who expressed the opinion that the fire originated in the battery room, where there was a collection of hydrogen, through the place being closed immediately after the charging current was switched off. A spark might have come from a short circuit between the wires from the cells and the switchboard. Cross-examined, he said that a skilled workman would have left the windows open. At the end of a long charge the dangerous condition was more pronounced through leakage or bad connections at the terminals, especially when old wires were used. Witness thought the fire occurred either through a spark or from the ignition of the inflammable covering of the cables.

Mr. H. BAWN, an electrician, said he had frequently charged the old batteries, and always left the window open to let out gases from the wooden building. There was always danger from leakage in battery rooms.

Mr. W. M. HARRISS, A.M.I.C.E., director of Gilbert Gilkes and Co., said that it was quite safe to use old wires. Any deterioration in insulation would have been evident during the charging period.

Mr. P. H. BAILEY, electrical engineer, said he had never heard of an explosion in a battery house due to hydrogen collecting after the charging ceased.

Mr. DERBYSHIRE, for defendant, said that they had been asked to pay for work before it was done, because it was destroyed. The plant had run 11 years and the presumption was that the plaintiffs' electrician had been negligent in leaving the place.

His LORDSHIP said that while he believed the goods were ordered, he did not think the plaintiffs were entitled to be paid for labour.

He found for the plaintiffs for £109 4s. 2d., and dismissed a counter-claim by the defendant.

Correspondence.

Correspondents should forward their communications* at the earliest possible moment.** ***No letter can be published unless we have the writer's name and address in our possession.

Earth Tubes for Radio Sets.

Regarding the discussion on radio earths in your columns, the following may be of some little interest.

For experiment, two other earths were tested against the water-pipe earth which is regularly used with my broadcast receiver. One was a buried earth consisting of a piece of galvanised iron sheet put down about two feet six inches, the other a well-known make of copper earth tube.

A crystal set was used, which had a micro-ammeter in series with the crystal. The following readings were obtained on Daventry (100 m.) and 2ZY (45 miles), at the same setting of the crystal:—

	Water Pipe.	*Buried Plate.*	*Tube.*
Daventry	70	70	65
2ZY	51	40	22

The figures relate to scale divisions, 23 of which equal one micro-ampere. In all other tests the figures have been of the same order, although their proportions have varied somewhat. My conclusions are that with the 1,600-metre wave a fairly good buried earth will almost equal the water pipe, but on 378 metres there is a very marked difference in favour of the water pipe, the tube showing up poorly.

The micro-ammeter mentioned was home-built at the cost of a few shillings and a lot of patience, but its infinite usefulness in attacking problems like the above has justified all the trouble. No mirror is fitted, but a pointer.

A. O. Griffiths.

Caergwrle, *June 7th*, 1926.

A Tip for the E.D.A.

In these days of coal rationing we are all asked to economise in the national interests, and by economising it is presumably meant that we should all use less gas and electricity, thereby cutting down the *quantity* of coal which is consumed at the gas and electricity works.

There is a big difference between quantity and *quality*, and a few recent incidents have led the writer to wonder whether our gas friends are quite as patriotic as their electrical competitors.

On arriving home the other evening, the writer heard a lot of grumbling in the kitchen, the complaint being that the rotten gas simply would not boil the kettle. Earlier in the day a similar complaint had come from the charwoman, who was mourning the loss of several more pennies which she had had to put in her slot-meter in order to get her usual *quantity* of gas.

Oh, yes, those of us who still use gas are being rationed all right, but apparently the rationing applies to both quantity and quality, and with the above-mentioned slot-meter

comments in mind, I am wondering whether my gas bill at the end of the quarter will be any less, or shall I lose on the swings what I am trying to save on the roundabouts. In other words, as a result of the poor quality of the gas, will my efforts at economising be knocked on the head by the increased hours I have to burn the gas and consequently a corresponding increase in quantity, which, no doubt, my gas meter will faithfully or unfaithfully register?

It would appear from the above remarks that a very nice little leaflet could be prepared by the experts of the E.D.A., as no matter how old or inefficient the plant is, or whether the "juice" is generated in Timbuctoo or—shall we say?—Hackney, it is all the same *perfect quality* and *cannot be deteriorated*.

Switching back again to the aforesaid gas grumbles, a further complaint was that the smell was decidedly more obnoxious than usual, so this, combined with the rationed quantity and poorer quality, has not acted as an advertisement for gas.

A few electrical slogans suggest themselves as follows:—

You can ration the quantity of electricity, but not the quality. There is and can be only one quality of electricity, and this is always perfect. There are no fumes with electricity, and consequently no smell. You can easily and safely control all your electrical circuits, and as for cleanliness, well—there is nothing else to touch it.

June 9th, 1926. **F. T.**

The Electrical Equipment of Collieries.

Your recent article on "Electricity in Mines" suggests a fairly reasonable and effective solution to the present coal problem.

Your contributor states that in American mines, where electrical coal-cutting machinery is installed, the output per man is three or four times what it is in this country. I don't know what it would cost to equip our mines with similar apparatus, but surely it would only be a fraction of the £23,000,000 said to have been spent by the Government on the subsidy—an expenditure, too, yielding no return.

If, now, the Government were to issue a loan, on similar lines to the War Loan, for the purpose of equipping the mines with efficient electrical machinery, the greatly increased output would not only enable interest to be paid on the loan, and in time pay off the loan, too, but would also enable wages to be maintained at their present level, and so solve one of the most pressing difficulties of the present situation. It would also place the mining industry on a sound foundation, and enable it to compete successfully in the markets of the world.

There would no doubt be difficulties of detail regarding the independence of the industry while partly financed by a Government loan, but these should not be insuperable—in fact, should be no greater than when the miners' wages were aided by a State subsidy.

Perhaps this suggestion will be worthy of discussion in your columns.

Liverpool, *June 10th*, 1926. **Stanley G. Joscelyne.**

Electrical Engineers' Salaries.

In the current issue a certain Council is applying for a mains assistant at a salary of £150 per annum. Does not this make an engineer feel that his scientific job is sadly on the down grade? The writer is not at present looking for a job, but feels very sorry for his brother engineers who have such insults as this flung at them. The advertisement is unfortunately typical of many that appear weekly in the REVIEW, and if this sort of thing continues it simply means that when a smart boy is anxious to become an electrical engineer, his parents will dissuade him from adopting that career. The result will be that in a few years' time no *real* engineers will be available. For the benefit of the Council which offers such miserly pay I would inform them that assistant cleansing superintendents receive a much more handsome salary.

June 5th, 1926. **Contractor.**

"Rings."

It is regrettable that so many valuable contracts are being placed abroad when our own country is at present in such a stagnant condition. In your issue of June 11th it is stated that the Leicester City Council has placed an order with a Zurich concern for a turbo-alternator. In the circumstances could it be blamed for choosing to deal with foreigners? The chairman of the Electricity Committee said that an examination of the British tenders revealed the remarkable absence of free competition, while subsequent events proved that the prices were fixed by a combination of British manufacturers. In other words "rings" are simply driving good business out of Britain and I, as an individual, would be happy to see all these unfair "combinations" made illegal. It is obvious to most of us that the prime function of "rings" is to keep prices inflated, and, of course, to prevent competition. Why should a few big manufacturers be permitted to dictate what the selling price of an article shall be when many of the articles could be sold at a much lower price and still allow a good margin of profit? From the writer's point of view "rings" are stumbling blocks to progress, as anything that stands for keeping up prices to an uneconomic level is useless to any country. I am all out for my own country, but in the particular instance mentioned above, had I been a member of the committee I should have felt compelled to agree with the majority in handing over the work to the foreign concern.

June 12th, 1926. **Non-Ring.**

[We think it only right to refer our correspondent, and others who are interested in this subject, to an article entitled "Prices of Electrical Plant," by D. N. Dunlop, published in the ELECTRICAL REVIEW, for February 29th, 1924, p. 330.—EDS. ELEC. REV.]

Trade-Mark Applications.

Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from June 2nd:—

Wylex. No. 467,926. All goods in Class 8.—G. H. Scholes & Co., Ltd., 27, Blantyre Street, Chester Road, Manchester.

Phonos (lettering and design). No. 466,768. Class 8. Apparatus for use in connection with radio-telegraphy and telephony.—Pettigrew & Merriman (1925), Ltd.

Cosmos Radio Valve (lettering and design). No. 467,878. Class 8. Thermionic valves.—Metropolitan-Vickers Electrical Co., Ltd.

Orolite. No. 468,322. All goods in Class 8.—O. Ruhl (1922), Ltd., 85, City Road, E.C.2.

Noirlac. No. 468,530. Class 8. Electric cables.—Falk, Stadelmann and Co., Ltd.

Lecite. No. 468,777. Class 8. Cables for electrical purposes.—Liverpool Electric Cable Co., Ltd.

Etho-Cone. No. 468,893. Class 8. Loud speakers and sound reproducers; and Etholag. No. 468,894. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Burndept Wireless, Ltd.

Vispark. No. 468,587. Class 13. Sparking plug heaters.—Miltiades A. Mitaranga, Marseilles. (Marks & Clerk, 57-58, Lincoln's Inn Feilds, W.C.2.)

Published Specifications.

Compiled expressly for this journal by Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

31,321. "Vacuum electric tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. December 31st, 1924. (251,673.)

1925.

551. "Means utilised for securing electric conductors to or in relation to contact members or apparatus to which it is desired to supply electric current." J. A. Crabtree. January 8th, 1925. (Cognate application 6,264/25.) (251,676.)

2,484. "Connectors or gripping devices for wires, rods, cables, and the like." Twiss Electric Transmission, Ltd., and G. H. Dean. January 28th, 1925. (251,679.)

2,972. "Carrier wave systems." F. W. Le Tall (Westinghouse Electric and Manufacturing Co.). February 2nd, 1925. (251,683.)

3,393. "Wireless receiving or transmitting apparatus." G. A. Morris and B. C. Stevenson. February 6th, 1925. (251,693.)

3,394. "Variable resistance devices." Igranic Electric Co., Ltd., and S. R. Wright. February 6th, 1925. (251,694.)

3,396. "Electromagnetically-operated selector with longitudinal and rotary adjustment for telephone exchanges." F. Merk. February 25th, 1924. (250,634.)

3,506. "Three-electrode valves." Marconi's Wireless Telegraph Co., Ltd., and E. W. B. Gill. February 7th, 1925. (251,701.)

3,761. "Electric motor generators." G. H. Fletcher and Metropolitan-Vickers Electrical Co., Ltd. February 10th, 1925. (251,704.)

3,799. "Method of mounting crystals for wireless rectification." P. V. Castell-Evans. February 11th, 1925. (251,706.)

3,848. "Telephonic receivers and the like." W. J. Palmer. February 11th, 1925. (251,707.)

6,322. "Automatic telegraph transmitters." C. J. Aston. March 9th, 1925. (251,727.)

8,245. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and J. Berry. March 27th, 1925. (251,744.)

9,419. "Dry-cell terminal." National Carbon Co., Inc. August 16th, 1924. (238,506.)

10,137. "Electrical switches." D. Grant. April 18th, 1925. (251,757.)

10,150. "High-frequency electric induction furnaces." C. R. Burch, S. R. Davis, and Metropolitan-Vickers Electrical Co., Ltd. April 18th, 1925. (251,758.)

13,135. "Magnetic separators." H. H. Thompson, A. E. Davies, and W. E. Box. May 20th, 1925. (251,780.)

15,605. "Electric ignition apparatus for internal-combustion engines." J. Lucas, Ltd., E. O. Turner, and F. W. Handley. June 16th, 1925. (251,794.)

16,416. "Electric-light fittings." British Thomson-Houston Co., Ltd., W. Millner, and S. J. Tucker. June 25th, 1925. (251,801.)

16,663. "Telephone apparatus." Neufeldt & Kuhnke. August 25th, 1924. (238,855.)

16,860. "Method and apparatus for making electrical condensers." Dubilier Condenser Co. (1925), Ltd. July 1st, 1924. (236,559.)

20,671. "Apparatus for the electromagnetic separation of ores." A. Davies. August 18th, 1925. (Cognate application 25,860/25.) (251,821.)

21,746. "Electric cord protectors." S. D. Black and A. G. Decker. August 31st, 1925. (251,827.)

23,805. "Device for indicating sparking and other disturbances and for automatically cutting out transformers, choke coils, and other electrical apparatus operating in an insulating medium." M. Buchholz. March 24th, 1925. (Divided application on 250,004. Addition to 198,936.) (251,843.)

25,136. "Manufacture of caps for incandescent electric lamps or the like." Edison Swan Electric Co., Ltd. June 29th, 1925. (251,854.)

26,126. "Device for the protection of electricity meters against the influence of external magnetic fields." Landis & Gyr Soc. Anon. February 4th, 1925. (247,159.)

27,295. "Electric knife switches." Akt. Ges. Brown, Boveri et Cie. December 8th, 1924. (244,058.)

29,817. "Process and apparatus for protecting electric or other cables." J. O. Gogry. November 27th, 1924. (243,741.)

30,669. "Construction of electric switch for use with steering appliances of motor road vehicles." G. C. C. Marriott and D. M. S., Ltd. December 4th, 1925. (251,892.)

31,192. "Methods of and apparatus for electric arc-welding." British Thomson-Houston Co., Ltd. December 26th, 1924. (245,090.)

1926.

722. "Control electrodes for space current devices." British Thomson-Houston Co., Ltd. January 8th, 1925. (245,779.)

1,430. "Incandescent catnode discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 3rd, 1925. (247,167.)

1,900. "Incandescent electric lamps." A. A. Samuel. January 22nd, 1925. (246,304.)